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- 23:109 A mosaic mother and a mosaic son.
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20:91	Spurway	An extreme example of delay in gene action.
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22:77 Suley — Modifiers of the expression of the gene gs.
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24:93 Valencia — Heterochromatic influence on variegation of rb.
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24:82 Gall — Effects of X-raying copper-fed Drosophila.
20:87 Hinton — Salivary chromosomes of irradiated larvae.
21:86 Hinton — Negative evidence on reverse mutations.
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18:53	Hsu	Racial differentiation of Drosophila montium.
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16:66	Pontecorvo	Somatic crossover in melanogaster-simulans hybrids.
17:64	Rendel	D. pseudoobscura A x D. subobscura.

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23:88	Buzzati	What is Drosophila obscura?

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24:96	Carpenter	New semi-synthetic medium.
16:70a	Glass	Improved formula for Drosophila food.
16:71	Lewis	Cornmeal, molasses, rolled oats food.
24:86	Lüers	A medium containing DDT.
20:93	Moree	A long-boiling culture medium.
17:66	Schultz	Improvement in technique for agarless medium.
17:67	Spassky	Cream of wheat-molasses fly medium.

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17:60	Harrison	Effect of culture conditions on mating.
19:59	Mainland	Low temperatures to inhibit emergence of adult flies.
19:60	Mainland	Prevention of suicides of newly emerged adults.
23:105	Mickey	Cellucotton in cultures.

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19:59	Altenberg	Method of mite control.
21:90	Crow	Preventing the spread of mites.
17:66	Gowen	Mold.
20:92	Hughes	Notes on mites infesting Drosophila cultures.
19:60	Mainland	Freeing cultures of pink mites.
24:97	Mickey	Furfural as mold inhibitor.
21:90	Mittler	Amount of propionic acid needed to inhibit mold.
22:79	Rifenburgh	Ridding Drosophila stocks of mites.
23:107	Smith	A substitute for Moldex.
20:96	Wallace	A new proposal for the control of mites.

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21:89	Callan	Collection of dechorionated Drosophila eggs.
22:79	Clark	Flotation method for collection of insect eggs.
19:62	Hill	Chemical removal of chorion from eggs.
18:58	Muller	Method to promote laying of unfertilized eggs.
22:80	Strømnaes	Egg-counting made easy.
24:99	Wortman	Method for collecting large numbers of eggs.

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22:75	Novitski	Desemination by low-temperature shocks.
23:106	Reeve	Measurement of living Drosophila.
15:17	Sarkissian	New method of selection of virgin females.
15:18	Sarkissian	Method of preparing cultures for virgin selection.
24:98	Wedel	Easy way to mail Drosophila cultures.

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18:53	Goldschmidt	Correction of statements in Bridges-Brehme.
20:93	Muller	Stock list: changes in classification.
20:94	Muller	Nomenclature changes adopted in stock list.

G. Construction of Stocks

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23:92	Lewis	New balancer for the third chromosome.
16:64	Muller	Viable non-crossover X-chromosome.
16:65	Muller	Stock with marked inversions of major chromosomes.
23:110	Muller	Use of rearranged X's and Y's in class work.

H. General Equipment

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19:59	Mainland	Use of Waring Blender in food making.
23:105	Mickey	Water table for controlling temperature.
21:91	Moree	Convenient label for experimental cultures.
24:97	Parker	Temperature control in small lab.
18:58	Spencer	Device for pouring food into bottles or vials.
16:72	Stalker	A new type etherizer.

I. Microscope

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J. Histological Techniques

23:106	Newby	Sectioning of Drosophila.
24:98	Rizki	Method of embedding Drosophila eggs.
23:103	Wilson	N-phenyl nile blue chloride as a vital stain for fat.

X. TRIPLOIDS, INTERSEXES AND MOSAICS

A. Triploids and Intersexes

24:82	Gloor	Larval polyploidy induced by cold treatment.
16:63	Gowen	Hermaphrodites in D. melanogaster.
20:89	Novitski	Triploidy in D. pseudoobscura.
17:63	Redfield	Mosaic eyes in melanogaster intersexes.

B. Mosaics

24:78	Bertani	Somatic elimination of X Chromosomes

19:58	Lamy	High occurrence of gonadic mosaicism.
23:92	Lüning	Gynandromorph production after mustard gas treatment.
15:38	Sidorov	Nature of mosaicism in the inversion sc^8.
16:67	Spurway	Spontaneous X-chromosome mosaics in subobscura
16:68	Steinberg	An astonishing gynandromorph.
23:109	Whittinghill	A mosaic mother and a mosaic son.
24:96	Whittinghill	Another complex mosaic.

XI. MATERNAL EFFECTS

20:84	Alikanian	The maternal effect.
22:70	Gardner	Case of genetically controlled cytoplasmic influence.
23:89	Gardner	Genes producing maternal effect on tumorous-head.

Research Notes

Alikhanian, S.I. A case of a different phenotypical manifestation of a lethal mutation.

In the course of study of the mutation process in the left end of the X-chromosome of D. melanogaster, a lethal given the number 76 was obtained. As long as this stock was carried on through attached-X's line (l^{76} y v f B/Dp215 x yy) nothing exceptional was noted. (For a detailed description of this investigation see my works in Zoolog. Zhurnal, vol. 16, No. 2, 1937 and Doklady Ak. N. USSR, No. 9, 1938).--However, as soon as this line was made homozygous, it was detected that besides the expected l^{76} y v f B/Dp215 males and l^{76} y v f B/l^{76} y v f B/Dp215 females, there appeared as well yellow daughters, i.e. females homozygous for the chromosome l^{76}y v f B but having no Dp215. The duplication 215 "covers" the region of the left end of the X-chromosome where l^{76} is located. The stock l^{76} was further carried on in se and always produced beside gray males and females a certain number of yellow females, i.e. females homozygous for l^{76}. --A careful study of the phenomenon revealed that females homozygous for the lethal can survive without the duplication. In attempting to obtain sons from these females, such were in fact obtained but only as exceptions.

Table 1

♀♀ l^{76} y v f B/l^{76} y v f B x ♂♂ Florida

l^{76} y v f B/Florida	♀♀ y v f B non-disjunctional	♂♂ wild type non-disjunctional	♂♂ y v f B (l^{76})
831	34	38	12

--The non-disjunctional females l^{76} y v f B/l^{76} y v f B were mated to Florida males. The offspring obtained was analogous to that given in table 1.

Table 2

l^{76} y v f B/Florida	♀♀ l^{76} y v f B non-disjunctional	♂♂ wild type non-disjunctional	♂♂ y v f B (l^{76})
145	23	29	--

--Different results are obtained from the mating of l^{76} y v f B/l^{76} y v f B Dp215 x l^{76} y v f B Dp215.

Table 3

♀♀ $\frac{l^{76}\ y\ v\ f\ B}{l^{76}\ y\ v\ f\ B}$ Dp215	♀♀ $\frac{l^{76}\ y\ v\ f\ B}{l^{76}\ y\ v\ f\ B}$	♂♂ $\frac{l^{76}\ y\ v\ f\ B}{Dp215}$	♂♂ $\frac{l^{76}\ y\ v\ f\ B}{}$
382	58	138	--

--As seen from this table, females homozygous for l^{76} carrying no dupl. 215 emerge in a lower number than females carrying the dupl. 215. It seems probably that this difference is not due to the character of the lethal but is depending on the frequency of disjunction of the duplication present in the gametes of both parents. A more striking feature of the data presented is the lack of 1^{76}yvfB males without the dupl. 215. While it was possible to obtain sons with 1^{76} chromosome but without Dp215 from mothers homozygous for 1^{76} and carrying no duplication, such males were never produced by mothers homozygous for 1^{76} and carrying Dp215,--Another phenomenon has still more drawn our attention. 1^{76}yvfB males obtained in the table 1 when mated to normal flies (y as well as ordinary) behave as quite normal males.--Of no less interest is the physiological character of the lethal mutation 76. The larvae of this line possess tumours which cause the death of such larvae on different stages of development.--A more detailed communication concerning this phenomenon will be given soon.

Belgovsky, M.L. Deletion frequency in the B^SL chromosome.

B^S males were X-rayed, the dosage being 3500 r, and mated to y v f car females. Individuals carrying a deleted B^SL chromosome were recorded among the F_1 females. In a total of 36,638 females the following aberrant types were found: v B♀-4, v car♀-1, vf B♀-1, v f car♀-3, v f♀-1, y v f♀-1. Evidently all of them, except of the last one, carried a deleted B^SL chromosome, the first two types having received this chromosome with the right break to the left of f, while the third, fourth and fifth types received a chromosome broken to the right of f. Thus the frequency of deletions in the B^SL chromosome was approximately 1/3700 at the dose of 3500 r. Deleted chromosomes with a break occurring to the left and to the right of f are recorded with equal frequency. The 5 females carrying a deleted chromosome with a break to the left of f were bred in order to secure the deleted chromosome, but they proved of very low viability and highly sterile. Only one of them had produced progeny consisting of 2 y v f car♀, while the other 4 died. It seems to indicate that the very low deletion frequency recorded is at least partly due to the unviability of the flies hyperploid both for the y and f regions.

Belgovsky, M.L. Symbols & characteristics of mutants and valuations.

T(1;3) Del 143-3. Found by Neuhaus and genetically identified as a deletion. Studied in metaphase plates by Gershenson, who found no free deleted chromosome, but discovered that one of the autosomes had been broken in two parts. A genetical analysis by Belgovsky showed that the distal end of the X, broken between sc and br, became attached to the proximal end of 3L (broken between st and the spindle fibre attachment), while the distal end of 3L was evidently attached to the XR.

Neuhaus, M. The influence of separate arms of the Y-chromosome on secondary non-disjunction in the females of D. melanogaster.

When single crossing-over between any arm of the Y-chromosome and the X-chromosome takes place in the females of the constitution XY^SX or XY^LX, separate or attached, short or long arms of the Y are produced.--The obtaining of parts of the Y-chromosome makes it possible to study the influence of separate arms of the Y on secondary non-disjunction.--Following results were obtained:

	Regular	Exeptional	% m
♀♀ $\frac{y\text{-}bb}{y\text{-}bb}$ Y x ♂♂	2183	101	4.42 ± 0.43
♀♀ $\frac{y\text{-}bb}{y\text{-}bb}$ Y Long arm x ♂♂	997	28	2.73 ± 0.51
♀♀ $\frac{y\text{-}bb}{y\text{-}bb}$ Y short arm x ♂♂	2749	40	1.43 ± 0.23
♀♀ $\frac{y\text{-}bb}{y\text{-}bb}$ Y^SY^S x ♂♂	2674	136	4.8 ± 0.4

Shapiro, N.I. X-rays dosage and the frequency of somatic mosaics. In 1936, an experiment was carried out according to our suggestion by our student Tcherkassova, V.I. in order to study the dependency of the frequency of arising mosaics upon X-ray's dosage. 3 to 52 hours old larvae were subjected to treatment. They were obtained from the crossing of +/+ females to y w f males. The frequency of occurence of mosaic areas was studied in F_1 males and females. The results of examination of the F_1 females are given in the table.--As seen from the data there is no linear proportionality between the frequency of mosaics and X-ray dosage. If the mosaic frequency is studied for each gene separately, it is possible to notice that a deviation from the proportionality rule is manifested by mosaics for the genes yellow-forked, in case they are both present on the same mosaic area, and for the gene white. No deviation from direct proportionality was obtained for the genes yellow and forked separately. Unfortunately, the work could not be completed. In particular it was not found out what kind of changes (point mutations, deletions, simple breaks, somatic crossing over) are responsible for the deviation from direct proportionality. However, already the given above material, enables us to assert with great probability that chromosomal aberrations play a dominant role in the formation of mosaicism. Somatic gene mutations arise under the influence of X-rays comparatively seldom. Approximatively among the same number of males as the number of females studied, there were obtained 12 somatic mutations of yellow, white and forked under the same X-ray's dosage. --Somatic crossing over which can as well produce mosaicism can hardly be considered as its chief cause. This is proved by the fact, that forked mosaics (including y f) are more numerous than y-mosaics. Forked mosaics arise chiefly as the result of breakages in the inert region of the chromosome. The fact that most forked-mosaics are not accompanied by the manifestation of the yellow gene points out to the important role played by deletions in the formation of mosaicism.

Table

Frequency of Somatic Mosaics in Females Raised from X-rayed y w f/+ Larvae

Dosage	300 r.	600 r.	900 r.	1200 r.	1500 r.	1800 r.
Number of females studied	7520	6695	2284	4120	1404	1081
Total number of mosaics	44 0.58±0.089	104 1.55±0.15	67 2.94±0.35	203 4.93±0.34	7.20±0.69	9.62±0.89
Mosaics for:						
white	16 0.21±0.052	45 0.67±0.10	30 1.31±0.24	106 2.57±0.25	56 3.98±0.52	51 4.72±0.64
yellow	15 0.20±0.051	20 0.30±0.067	12 0.53±0.15	29 0.70±0.13	13 0.93±0.25	22 2.03±0.42
forked	12 0.16±0.046	33 0.49±0.085	16 0.70±0.17	44 1.07±0.16	16 1.14±0.27	18 1.67±0.39
yellow-forked	1 0.01±0.011	6 0.09±0.036	9 0.40±0.13	24 0.60±0.11	16 1.14±0.27	13 1.20±0.33

Technical Notes

Sarkissian, S.M. A new method of selection of virgin females in Drosophila. While studying the genetics of the domestic fly (*Musca domestica*) we encountered the necessity of elaborating some proper method of selection of virgin females in *Musca domestica*. This method has been found in the course of a series of experiments. It is based on the discovery of the fact, that if newly emerged flies are deprived of food, females can live during the whole course of their starved life together with males and remain virgin.--After this method was proved to hold true for Musca domestica, it was surmized that this phenomenon can be used for other taxomically related to Musca domestica groups of insects. Therefore experiments were undertaken with D. melanogaster. --Approximately 220 females have been studied. They were all kept without any food together with males from the time of their emergence through 52, 48, 42, 28 and 17 hours. Not a single female gave offspring in the experiment, while the control females gave normal progeny.

Sarkissian, S.M. Description of the method of preparing cultures for selection of virgin females. In order to obtain virgin females it is necessary to put a scroll of paper (a) in the vial (b) containing larvae, in such a manner that its lower border should touch the food with larvae and its sides cling close to the inner surface of the vial. It is better to choose the period when the first adult larvae begin to pupate.--As soon as the desired number of larvae have pupated on the surface of the scroll of paper, it must be transferred to an empty vial (c), containing no food, where it will remain for the rest of the time. In order that no food whatever should be transferred in the vial "c", it is necessary to cut off the lower part of the scroll.--The duration of life of starving flies varies greatly and is dependent chiefly on temperature and humidity conditions. Our experiments were carried out at 22°C.--Experiments are being continued.

ABSTRACTS OF PAPERS DEALING WITH DROSOPHILA SUBMITTED TO THE SEVENTH INTERNATIONAL CONGRESS OF GENETICS BY RUSSIAN GENETICISTS

Russian Abstracts

Belgovsky, M.L., Inst. of Gen. of the Acad. of Sci. of the USSR, Moscow. Frequency of minute chromosome rearrangements in relation to X-ray dosage.

We have studied the frequency-dosage relation of the lethal yellow "mutations" occurring in treated scute^8 chromosomes. These changes were chosen as, in our previous investigations (Belgovsky, 1938), we had come to the conclusion that they represent mostly minute rearrangements. Two doses of X-rays, namely 1000 r and 4000 r were used. Treated scute^8 males were crossed to yellow females and F_1 yellow daughters recorded. A total of 14,329 F_1 females in the heavy dose series and 45,167 F_1 females in the light dose series were counted. The ratio of "mutation" frequency at 4000 r to that at 1000 r, corrected for spontaneous "mutations" (rather frequent in the scute^8 chromosome), proved to be 3.724 ± 0.776, the expected ratio in the case of simple proportionality being 4.00. This result does not contradict the hypothesis that minute rearrangement frequency is proportional to the dosage. The difference between the frequency-dosage relations of gross and minute rearrangements thus established shows that the mechanisms of their origination are different. Assuming chromosome breaks to be induced by X-rays directly, we might explain this result on the basis of the independent breaks hypothesis in the case of gross rearrangements, and of the contact hypothesis applied to minute chromonema coils in the case of minute rearrangements. If, however, chromosome breaks are secondary effects of radiation and contact between chromosomes is a prerequisite of any break whatever, then it seems difficult to put forward now an explanation of the difference found.--The similarity of frequency-dosage relations in cases of lethals and minute chromosome rearrangements shows that either the former are mostly minute rearrangements, or the frequency-dosage curves of point mutations and minute rearrangements are similar. The first possibility can evidently be neglected, as not all lethals cytologically studied by different authors were found to be deficiencies and as it is very improbable that point mutations are unable to cause the death of the organism. Therefore we must adopt the second explanation and conclude that there is some fundamental similarity in the mechanisms of origination of point mutations and minute chromosome rearrangements. If the frequency-dosage curves of point mutations and minute chromosome rearrangements are really very similar or even identical, we must conclude that their relative frequencies at different doses are the same, and consequently the relative frequency of minute rearrangements in nature (at zero dose) must be as high as at different X-ray doses. This being the case, they must evidently play a rather important role in evolution.

Berg, R.L., Leningrad State University, Leningrad. A genetical analysis of wild populations and differences between wild and laboratory lines of D. melanogaster.

Increase in dominance of normal alleles (and correlated decrease in mutability) is gradually developed in the course of evolution in the interest of the individual. However, this makes possible the accumulation of harmful mutations in the genotype of the individual and the formation of systems of balanced lethals, and it limits the possibilities for the species to make use of favorable mutations. Thus a conflict results between the interests of the individual and those of the species. --A lowering of dominance is possible in a species that has a structure adapted thereto, allowing competition between incompletely isolated groups.

The victors in this competition are those individuals that come from groups in which the dominance of normal alleles and consequently contamination of the genotype with harmful mutations is the least, because in such groups harmful mutations could more readily be eliminated and useful mutations more readily preserved by natural selection.--A decrease in dominance brings about an increase in mutability, the latter in its turn leads to a new decrease in dominance and so on. It is this conflict of the processes of increase and decrease in dominance that determines the degree of dominance of genes in the population.--The disturbance of the species system that is possible under conditions of complete isolation, during the process of domestication or transfer to laboratory conditions, and sometimes even in nature, is accompanied by an increase in dominance and by a decrease in mutability.--There were two populations studied: one in Uman (Kiev Region, Ukraine) during the summer and fall of 1937 and the other in the Nikita Botanical Gardens(near Yalta, Crimea) during the fall of 1937 and the summer and fall of 1938.--A study of the frequency of phenotypical aberrations (i.e. deviations from the normal phenotype) in flies from six different centers of propagation (wineries, fruit depots, etc.) has shown that a population, even when it is rapidly growing, still consists of distinct micropopulations.--The frequency of aberrations in the phenotypes of flies belonging to different micro-populations is different and can be correlated with the intensity of selection, there being more aberrations wherever selection is less intense. There are less aberrants among migrant than among non-migrant flies. As the population becomes more numerous, the percentage of aberrants increases. They are more numerous among flies recently hatched from pupae (collected either as still unpigmented, i.e. just hatched flies or as pupae which complete their development later in vials) than among flies that had already been subjected to the action of selection during the imaginal stage. Aberrants are more frequent among females than among males. As the population grows this difference is smoothed over.--These conclusions are based on statistically significant data. 35,551 flies were collected in nature (either as imagoes by means of traps or as pupae) and 3,125 aberrants were found among them.--358 aberrants were studied with the purpose of determining the character of their inheritance. 248 (68.2%) proved to be hereditary.--Of the hereditary aberrations 173 (69.8%) proved to be dominant, 75 (30.2% recessive. All the sex-linked mutations (26 cases studied) proved to be recessive.--Among phenotypically similar aberrations there were observed dominant aberrations as well as recessive ones. In heterozygotes as well as in homozygotes penetrance and expressiveness of mutations are very variable. They are higher among males than among females. The more pronounced manifestation of harmful characters in females seems to be correlated with the existence of an extra factor of selection among males (competition among males for females). It was proved experimentally (in cooperation with Alexandryskaja) that mutant males have less changes in this competition than normal ones.--Several observations have shown that there exists a possibility of a rapid modification of a dominant mutant character into a recessive.--Most mutations are however dominant to some extent.--This has been proved for lethals by R.A. Mazing.--This dominance of mutations makes them accessible to the action of selection in heterozygotes. --The concentration of heterozygotes for lethals, visible and sterility mutations is nevertheless very high. Thus in the population of Nikita Botanical Garden each fly is heterozygous for two mutations producing marked deviations from the norm.--276 lethals were detected among 1,905 chromosomes, 87 visible mutations among 1,627 chromosomes (X, 2 and 3) and 29 sterility mutations among 187 chromosomes (3) studied. Among 531 chromosomes investigated at Uman there was found one translocation (involving the second and the third chromosomes), lethal when homozygous.--41 third-chromosome lethals detected in one of micropopulations of the Nikita Botanical Gardens proved to be changes of 29 different genes, 21 sterility mutations--of 11 different genes. The high concentration of mutant genes may be partly as the result of the recurrent mutation of genes.--The frequency of occurrence of lethals and visible mutations in all the chromosomes per generation is 12.5% in the population of the Nikita Garden.--The mutability of the X, 2 and 3 chromosomes was studied. In the progeny of y w f females crossed with wild males the percentage of males carrying sex-linked mutations proved to be nearly the same (0.2% as in the wild state (0.297%).--The mutation process and selection are apparently of primary significance in determining the gene composition of the population, while genetico-automatic processes are only of secondary significance. Wild populations differ from laboratory stocks by their high mutability and low dominance of normal allele. This difference is discussed more fully in another communication.--The detection of these distinctions between wild populations and laboratory stocks may serve as an indirect proof of the existence of a species structure of characteristically adaptive type.

Various lines of D. melanogaster, differing as regards their geographical origin, were compared with respect to different properties, such as dominance, mutability, etc. Such a comparison made it possible to establish correlations between the properties studied. That such correlations exist has been pointed out by Muller, Haldane, Plunkett, Wright, and Goldschmidt. There are grounds for assuming that these correlations result from the activity of the gene in ontogeny, which activity may differ in different lines. High activity of the gene in ontogeny (which depends on gene dosage, i.e., on excess gene dosage) leads to the rapid attainment of the margin of safety, the stability of form-genesis reactions, and, consequently higher dominance, low mutation rate, and but slight ability to form phenocopies. From this it follows that the mutation rate should be the less affected by external factors, the lower the mutability.--The level at which intergenic and interchromosomal balance is established rises with an increase in gene activity. If balance lies at the basis of correlation and compensation in ontogeny, they (and consequently, viability under extreme conditions of treatment) must be the greater, the higher is gene activity.--The difference in stability between genes of the sex chromosome and those of the autosomes indicates a difference in the activity of these genes and, consequently, in their role in interchromosomal balance. This is indicated likewise by the different level of interchromosomal balance in sex chromosomes and autosomes (Muller, 1930) and by the presence of a mechanism of gene-dosage compensations in the X-chromosome (Muller, 1932, 1935). If the intensity of selection is a factor in gene stabilization, the difference in mutability between genes of the sex chromosome and of the autosomes is greater, the greater the dominance of the autosomal genes, since it is this dominance that creates the difference in intensity of selection between sex-linked and autosomal genes. The higher the level of intergenic and interchromosomal balance of the individuals of any given line and the greater the difference between the sex chromosome and the autosomes in this line, the less should be the viability of individuals with disturbed balance (super-females). The writer made a study of the differences between lines as regards: (1) the frequency of occurrence of spontaneous mutations, both lethal and visible, in the sex chromosomes and autosomes; (2) the dominance in them of mutations obtained from wild populations; (3) the viability of super-females appearing in the progeny from crosses between males from various lines and y w f females (in these experiments Edna Brissenden participated); and (4) the relative frequency of occurrence of mutations as between the sex chromosomes and the autosomes. The frequency of occurrence of phenocopies in different lines was studied by Lobashev and Solodovnikov, the dependence of the mutation rate on the physiological condition of the organism (the aging of the soma) by Zuitin and Pavlovets, and viability under extreme conditions of treatment (with temperature, narcotics, etc.) by Vladimirsky.--The character of the correlations between these properties confirms their dependence on gene activity during ontogeny. The possibility of establishing correlations for the whole genotype and not merely for single genes shows that changes in the activity of different genes apparently take place in the same direction. The existence of correlations points to the possibility of the coordinated evolution of different properties. Wild lines differ, as a rule, from laboratory lines in their higher mutability, lower dominance of the normal allelomorphs, less difference in mutability between sex-linked and autosomal genes, and greater viability of the super-females in the progeny of the males of these lines. The difference in dominance is due both to differences of the normal allelomorphs and of the genotype as a whole.--The mutation rate among flies caught in nature is not lower than among flies of the same wild line kept in the laboratory for a few generations. The production of an isogenic line of one of the autosomes also does not affect the mutation rate in the autosomes. This indicates that high mutability is a property of the genes themselves rather than of the genotype as a whole. Excess gene dosage is apparently greater, as a rule, in laboratory than in wild lines. This may be due to the disturbance of the species system in laboratory lines resulting from isolation.

Dubinin, N.P., Inst. of Experimental Biol., Moscow:USSR. The genetic structure and the evolution of species.

(I) *Introduction*: The progress of modern genetics has shown the main hypothesis of Darwinism to be correct. Following the investigations of Charles Darwin genetics has opened up entirely new prospects for the study of evolution. We are indebted to S. Wright, R.A. Fisher, J.B.S. Haldane and others for a number of fundamental works in the field of theoretical genetics and evolution.--The experimental and theoretical trends of our studies in evolution have started from the works of several Russian investigators--S.S. Tschetverikoff (1927), N.P. Dubinin (1931 etc.), D.D. Romashov (1931 etc.).--(II) *Theoretical Analysis of the Problem*: The genetic structure and evolution of the species has been studied theoretically in connection with the analysis of the significance of the system of species formed under the influence of ecological, biological, geographical and other factors. These studies have led Romashov and the author (1931, 1932) to show that the role played by casual stochastic deviations in the ratio of the gene frequencies (automatic genetic processes) is one of the most important phenomena of evolution which relates the mutation phenomena to the zone of action of natural selection. --During recent years these investigations have brought us to a series of conclusions regarding the form and nature of the automatic genetic processes in connection with various forms of isolation, migration, numerical fluctuations of populations and disproportion of sexes. The special significance of all these phenomena in the course of primary processes of species formation has been established. Several of these problems have been mathematically worked out by A.N. Kolmogorov, V.J. Glivenko and N.V. Smirnov.--(III) *Experimental Study of the Problem* (A) (The Mutation Process): The variability of the genes has been investigated in visible mutations (the sex chromosome) and lethal genes (the sex and second chromosomes) of a number of populations of *D. melanogaster*. The general pattern of gene variability in nature has been studied. The results show that all kinds of morphological and physiological hereditary changes occur as mutations. Certain peculiarities of the mutation process, which are connected with the distribution of the genes which change the mutation frequency, have been discovered.--The variability of chromosome structure has been studied in natural populations in a number of species of the *Drosophila* genus. An attempt to elucidate the peculiarities of chromosome mutations of different species has been made by means of X-ray treatment and a comparative study of *D. melanogaster* and *D. funebris*.--(B) (Characteristics of Hereditary Variability in Populations): Populations contain an enormous hereditary variability which constitutes the basis for the evolution of separate populations and of the species as a whole. The most widespread mutation types are small physiological and morphological mutations, and recessive lethal genes, and then structural chromosome mutations (mainly inversions). Many gene mutations found in nature are but slightly specific. When crossed they show weak and unstable characters, and when analyzed, they disclose a very complicated hereditary picture. Clearly inherited and well pronounced mutations are rarely met with. The great majority of hereditary changes are recessive and are concealed in the populations in heterozygous condition, although a whole group of changes is manifested in a semi-dominant state. A study of small physiological mutations on such characters as fertility, duration of life, general viability etc., has led to the discovery of the great plasticity of natural populations with regard to a number of most significant physiological characters.--However, in spite of the enormous diversity of hereditary variability in populations, our investigations have disclosed a few specific and limited directions in the variability of single characters of the species, which directions proved to be parallel in a number of species.--Mass non-hereditary variability among populations is often found parallel with hereditary variability.--(C) (Distribution of the Mutations Among the Populations of Species): A study of the genetic structure of single populations has shown that it is caused by the mutation process, by the action of the automatic genetic processes which multiply some of the mutations up to the beginning of selection, and by the action of selection. --Of special interest are the distribution and the frequency of mutation of lethal genes, since their analysis discloses the real connection existing between the mutation process and negative selection.--Single populations (ecogenotypes) display (1) a great variety of small mutations, so that every female taken from nature gives rise to a stock differing from others by this or that character, (2) a number of pronounced gene mutations and chromosome changes, multiplied to a certain degree and limited as to diversity and (3) a great number of different lethal mutations.--As to the distribution of marked mutations throughout the system of populations, some genes were found to be inherent only to a given ecogenotype, whereas others have a certain area of distribution and, finally, some are found throughout the whole species.--In comparison with the complex distribution of the gene mutations, the structure of the species with regard to chromosome mutations is simpler. --Inversions, several endemic, a number widespread, and some distributed throughout the entire area of the species (USSR, Western Europe, North America), have been found in *D. melanogaster*. The automatic genetic processes which have operated throughout the entire history of the species play a great role in the distribution of the chromosome mutations. A comparative study of various *Drosophila* species has shown that they vary greatly in the distribution of chromosome mutations and in the phylogenic history of single chromosomes; all this has its counterpart in the specificity of the systems of different species. One *Drosophila* species was found to represent a permanent structural heterozygous condition and to display a peculiar picture of karyotype variability and evolution.--A study of the distribution of mutations within separate populations and within a system of populations makes possible an experimental analysis of the genetic basis of the system of species and of their evolution.--(D) (The Phenotypic Realization of the Genetic Structure of Populations): Investigations of the phenotypic realization of hereditary variability discloses the primary material which lies at the foundation of natural selection. This phenomenon is conditioned by homozygosity for recessive mutations and by heterozygosity and homozygosity for dominant changes and for chromosome mutations. The great diversity of the gene content of populations makes for an enormous phenotypic variety for the action of natural selection at any given moment during the life of the population.--The specific character of the systems of different species plays a decisive role in the phenotypic realization of the genetic structure of populations.--The study of polymorphism of hereditary aberrations in *Drosophila* melanogaster makes it possible to elucidate both the selective role played by different mutation types and the correlation existing between the genetic constitution of populations and its phenotypic manifestation in nature.--*(IV) Conclusion*: The main factors determining the genetic structure within the system of the species are: variability of the genes, variability of the structure and of the number of chromosomes, variability due to crossing and hybridization, automatic genetic processes and natural selection.--Our theoretical investigations have disclosed the evolutionary role played by chance fluctuations in the ratio of the gene frequencies. --However, natural selection remains the principal factor which determines the adaptive evolution of populations.--Our experimental studies are in complete accord with theoretical analysis. They bring out experimentally the main factors which determine the structure and the evolution of populations.--The results obtained indicate the lines of further investigations.

Kerkis, J., Inst. of Gen., Acad. of
Sci. of the U.S.S.R., Moscow.
The effect of low temperature on the
mutation frequency in *D. melanogaster* with consideration about
the causes of mutations in nature
(15:25 in original DIS)

Brown ebony males were treated with low temperature (ca. -5.5 ÷ -6.0°C.) during 1.5 - 2 hours. A total of about 34000 males were treated from which only 53 survived and gave offspring. They were crossed with ClB females immediately after treatment. Two series of F_2 offspring from ClB F_1 females crossed with y fa v f dl-49 males and from F_1 males crossed with bw e females, were used for detecting the X-chromosome lethals and for studying the translocation frequency between the Y, 2, and 3 chromosomes respectively.--Of the 917 treated X-chromosomes, 13 sex-linked lethals were detected, while only 5 lethals were found out of 1934 X-chromosomes in the control series. The rate of mutation is 1.42% and 0.26% respectively, the difference being equal to 1.16% ± 0.318%, i.e. highly significant. No translocation was found among the 1254 cultures of treated series or in the control series.--A relatively high percentage of lethals in the progeny of the males treated by low temperature seems to indicate that the coincidence of the type of action of positive temperatures on mutation rate with the Vant Hoff rule for the rate of chemical reactions is apparently an accidental one. Mutations or changes in the very complex molecular structure of the gene occur as a result of breaks of any kind of the biochemical balance of the cell or chromosome, and these changes of structures of the gene can be induced by any physiological or physico-chemical factor external in relation to this structure. These conclusions are supported not only by our own results, but also by those of M. Navashin, obtained in 1933 *et seq.*, on the frequency of chromosome mutations in aged seeds. In this sense it is hopeless, in our opinion, to search for any definite factor responsible for spontaneous mutational processes in nature. The cause of the production of mutations is therefore the same as that of the variability of matter of any kind, i.e. the interaction of genic substance with the surroundings in the broad sense of the word. The endless variety of kinds of interaction of the organism with surroundings together with the intercellular metabolism are the very causes of mutational process in nature. The short wave radiation has its own peculiarities because of its strong ability to induce strictly local changes in the molecular structures. Numerous experiments have already indicated clearly enough that the role of this factor in the spontaneous mutational process in nature is very limited.

Khvostova, W.W., Inst. of Experimental Biol., Moscow. The influence of the proximal chromosome regions on the position effect of the cubitus interruptus gene in D. melanogaster (15:25 - 26 in original DIS)

The gene for cubitus interruptus, located near the spindle fibre of chromosome 4 of D. melanogaster, gives a position effect which consists in the dominance of the normal allelomorph growing feebler as it is removed from the inert region of chromosome 4 and as it becomes attached to the active regions (Dubinin and Sidorov, 1933; Khvostova and Gavrilova, 1935).--This paper describes 193 cytogenetically studied cases of the position effect of ci+. The following aberrations were found: 1 inversion in chromosome 4, 161 translocations between chromosome 4 and other autosomes; 12 translocations between the fourth and the x chromosomes, and 19 between the fourth and the Y chromosomes. The breaks were found along almost the entire length of chromosomes 2 and 3, except in the inert and in the adjacent active regions, which occupy about 20-25 per cent of the length of the arms.--The absence of breaks in these regions may be due to the specific methods used for detecting the translocations. The proximal regions do not give the position effect of ci+. This is proved by 11 aberrations with chromosome 4 (which did not give the position effect of ci+) showing 4 aberrations as translocations with the inert regions of chromosomes 2 and 3, and 2 with their proximal regions. In 5 cases the breaks occurred to the left of the ci gene, which was therefore not removed from the proximal inert region of chromosome 4.--A study of the manifestation of ci in translocations with breaks in different chromosome regions showed that two translocations with the most proximal breaks gave the most feeble manifestation of ci. This fact confirms the conclusion that the chromosome regions located close to the spindle fibre do not decrease the dominance of ci+ (or do so only to a slight extent).--A study of translocations with the X chromosome (which gave the position effect of ci+) showed that translocations with breaks in the proximal parts of the active region and in the inert part to the left of bb give the position effect of ci+.--A study of translocations with the Y chromosome (which gave the position effect of ci+) showed that the breaks in the Y chromosome occur only in the distal regions in both the short and the long arms. In the proximal parts of both arms (about 1/3 of the length of each arm) no breaks were found.--The following conclusions are thus indicated: only the proximal part of the region of the X chromosome adjacent to the spindle fibre, and the proximal regions of both arms of the Y chromosome, are analogous to the inert regions of the autosomes in their action on the ci+ gene (they do not weaken its dominance). The distal regions of the Y chromosome and a fragment of the inert region of the Y chromosome (the fragment located to the left of the bb gene) are analogous in their action to that of the active parts of the autosome (they weaken the dominance of ci+).--A study of 6 translocations which gave the position effect of ci+ showed that chromosome 4 is attached to the proximal regions of chromosome 2 and 3 (regions 41, 80, 81 on Bridge's map), which were removed through inversion from the spindle fibre. This shows that the proximal regions which normally do not give the position effect of ci+ acquire this capacity when removed from the spindle fibre. The data obtained may be explained in the following way: (1) The inert substance of the chromosomes has a specific influence on the action of the ci+ gene and this influence spreads to the adjoining parts of the active regions; when the active regions are removed from the inert regions, the influence of the inert substance stops. In this case the inert substance of the X and Y chromosomes becomes differentiated into regions which have various actions on the ci+ gene. (2) The position of the ci+ gene in relation to the attachment point of the spindle fibre influences its action; the regions (both active and inert) lying near the attachment point of the spindle fibre do not decrease the dominance of ci+; the remote regions do decrease it.--This specific influence of those chromosome regions located near the spindle fibre on the function of the gene may be explained by their peculiar structure and by the peculiar intergenic connections which affect the action of the ci+ gene.

Kirssanow, B.A., Inst. of Experimental Biol., Moscow.
Relation between changes of crossing-over and X-ray dosages and certain problems of the process of crossing-over
(15:26 - 27 in original DIS)

Crossing-over was studied in chromosome 3 in D. melanogaster. X-rays increase crossing-over in the mid-region of chromosome 3 during the first three days after irradiation. The maximum changes of crossing-over in chromosome 3 are produced by X-ray treatment on the seventh day after irradiation. Crossing-over increases in the mid-region and decreases in the distal parts of the chromosomes. Increases in the X-ray dosages increase the changes of crossing-over at every stage of the experiment, but only to a certain limit, which varies for each stage. When the limit has been reached an increase of the dosage of X-rays either does not cause any considerable changes in crossing-over or even (in the case of very large dosages) decreases these changes. This top limit of the changes of crossing-over increases from the first to the seventh day after irradiation and reaches its maximum in the st-p region.--A comparison of the increase of crossing-over in the mid-region and of the decrease of crossing-over in the chromosome ends has shown that the predominance of the first over the second is not great; on the average it amounts to about 5 per cent of crossing-over (with certain fluctuations in some experiments). This predominance (we shall call it residual crossing-over) does not differ significantly from the data published on the frequency of translocations between chromosomes 2 and 3 in females and from the frequency of crossing-over in chromosome 3 in males. The approximate coincidence of the frequency of the above-mentioned processes and their similarity in genetic behavior and in reactions to external factors makes it possible to assume that the nature of these processes is similar.--The less the initial crossing-over frequency per unit of cytological chromosome length, the more crossing-over frequency may grow in comparison with the initial frequency.--The increase in the frequency of crossing-over in the regions h-st, st-p, and p-ss, caused by inversions in non-homologous chromosomes, takes place mainly at the expense of single crossovers. Irradiation of flies of the h st p ss/++++ structure increases the frequency of crossing-over within the regions h-st, st-p, and p-ss at the expense of multiple crossovers to a considerably higher degree than when there is an accumulation of inversions. X-rays decrease the frequency of crossing-over in the distal regions of the X-chromosome, whereas inversions in non-homologous chromosomes increase this frequency.

Koltzoff, N.K., Inst. of Experimental Biol., Moscow.
The participation of the chromosomes in cell-metabolism
(15:27 - 28 in original DIS)

(In the present paper are discussed the results of the author's investigations on the growing large oocytes of Triton, chick and pigeon). The individual chromosomes (from leptotene till the reduction metaphase) can be seen in the growing large oocytes of Triton, chick and pigeon.--The author holds that there is a marked difference between the stable genotype of the chromosome and its phenotype, which undergoes some changes in the same chromosome during the various stages of development. Only the genonema belongs to the genotype, whereas chromoplasm, chromatin, vacuoles, etc. are phenotypical structures whose changes do not influence the hereditary qualities of the genonema.--The genonema is a fine filament with a series of enlargements--elementary chromomeres. It is present in every chromosome during all the developmental stages and is stretched out at the stage when the chromosomes attain their maximum growth. During metaphase, the genonema is coiled into a spiral or screw inside the chromoplasm; at this stage the chromosome is not divided into visible segments. In the initial stages of oogenesis, the genonema is gradually unrolled in length; this unrolling is accompanied by the appearance of the segments of the chromoplasm, i.e., of chromomeres. Later on the primary large chromomeres separate into many secondary ones. During the fourth and fifth periods of oogenesis, the reverse process takes place, i.e., the genonemata are coiled again and the secondary chromomeres are fused into larger tertiary chromomeres or even into a joined indivisible mass of chromoplasm. --The genonema and its genes remain chemically stable throughout oogenesis, and do not undergo any metabolic changes, viz. oxidation and reduction. The genonema represents the resistant genotype of the chromosome and can be changed only through mutation. The growth of the genonema in width is effected through apposition from the surrounding chromoplasm; its longitudinal splitting is to be looked for during the period of maximum length, i.e., during interkinesis. This splitting of genonemata can be separated by a long interval from the moment of division of the chromosomes, which can be observed in mitosis or meiosis.--Chemical metabolism takes place in the surrounding chromoplasm in the immediate vicinity of the genonema. Chromoplasm, together with chromatin which impregnates it during some stages or envelops it as a protective sheath, is continuously modified throughout oogenesis; it either accumulates large masses of nutritive substances from the Karyoplasm and nucleoli (expecially in the primary or tertiary chromomeres) or is reduced to a fine, possibly monomolecular, film.--^Chromatin, i.e., thymonucleic acid, completely disappears from the chromosomes during the second period of oogenesis and reappears again only in the fifth period; the chromatin should, therefore, by no means be included in the genotype of the chromosome and hence it cannot be regarded as an ingredient of the genes. Chromatin is primarily a solid protective sheath of the chromosome which at some stages isolates the genonema from the karyoplasm and determines the definite form of the chromosomes which is convenient for karyokinetic movements.--Although the genonema does not take an immediate part in the chemical metabolism, its participation in the process of physico-chemical assimilation is very important. The genonema contains the ready patterns of all complicated proteids or other substances specific to the species or the individual, which had once been produced during the long process of evolution. It is improbable that such complex substances could be synthesized every time anew without the ready patterns. The genonema and its single parts, the genes, are "touch-standards"; in their neighborhood the process of assimilation is begun which from a physico-chemical point of view is an autocatalytic crystallization process. A new genonema is precipitated alongside the existing inherited genonema by apposition. The material necessary for the construction of new genonemata is yielded by aminoacids, polypeptids, carbohydrates, etc. which are contained in the chromoplasm; the energy necessary for crystallization is derived from chemical metabolism proceeding in the chromoplasm and the karyoplasm.--The process of assimilation around the genonema is especially intense during oogenesis, when the genonema is free from the chromatin-sheath and lies in the karyoplasm, being surrounded only by a very thin film of chromoplasm. With the appearance of the "lamp-brushes", the colloidal transverse threads arise in immediate connection with the elementary chromomeres; the whole nucleus is divided into sections corresponding to the "lamp-brush" chromosomes. When the process of crystallization is completed the transverse threads leave the chromosome and remain lying free in karyoplasm, which during meiosis joins the protoplasm of the egg. In this way, the egg is enriched with inherited gene-substances of maternal origin. The same process of crystallization, i.e., assimilation of the gene-substances, very probably precedes each cell division during the interkinesis phase which is a truly active period of cell-life.--Only during the third period of oogenesis can the minute elementary chromomeres be noted, perhaps even genes, which are unrolled alongside of the straightened "backbone" thread of the genonema. At the earlier and later stages of oogenesis we observe fewer compound chromomeres; each of them including a lot of elementary, minute chromomeres. The chromoplasm of the compound primary and tertiary chromomeres functions as an isolated laboratory, where the products of assimilation of the neighboring genes undergo different chemical reactions. We can thus explain the phenomenon of the "position effect" established by geneticists.—The author tries to prove the hypothesis, proposed by him first in 1927, that the genonema is a gigantic chain-molecule in which the radicals play the role of genes. During cell division two genonema-molecules (after conjugation--four molecules) unite, forming an "elementary micellary body".

Kozhovnikov, B. Th., Inst. of Experimental Biol., Moscow. Experimental study of crossing-over between non-sister genes in sister chromatids.

It follows from a number of studies that in sister chromatids no crossing-over occurs between sister genes. It has also been shown by Sturtevant and Muller that double Bar arises only if there is unequal crossing-over between non-sister chromatids. Bridges has described Bar as a duplicated section. The conclusion is thus indicated that crossing-over between sister chromatids does not take place even in those cases where it ought to occur between non-sister genes. --The purpose of the present study was to verify this conclusion on chromosome structures in which the duplication is sufficiently great.--In order to obtain the necessary stocks the inversions B25 and B26, where the left break had occurred near Bar and the right one in the inert region, were used and the sc^8 inversion whose left break is near the left of sc and the right one in the inert region in front of the bb gene. Females heterozygous for sc^8 B25 or B26 were obtained which were crossed with males carrying the translocation Bar Stone. A long chromosome forms in these females, as a result of crossing-over on the B-bb region (i.e. in the region which is common to both inversions). The proximal part of the long chromosome consists of the whole chromosome sc^8 (except a small region at the left end containing the y ac genes), whereas its distal part consists of chromosome Bar 25 (or B26), which is devoid of the right region containing the inversion and the spindle fibre. The F$_1$ flies which had received the long chromosome should be females, but they are non-viable because they are hypoploid for a considerable region of the X-chromosome. However, when the ovum containing the long chromosome is fertilized by a spermatozoon which carries only the right region of the X-chromosome from the translocation Bar Stone, the flies prove to be quite viable. In this structure there is hypoploidy for only a minute region of y ac. These females may be bred as a constant stock when they are crossed with males carrying the translocation Bar Stone. Two such stocks were formed: 25/8 and 26/8; the figures indicate which inversions were used for this line. In the stocks thus obtained the long chromosome contained a recessive allelomorph in its distal part and a dominant allelomorph in the proximal part, or vice versa. Double crossing-over between the distal half of the long chromosome and the proximal region of the sister chromatid was studied in this structure. This was proved by the occurrence of homozygous recessives (the ct gene served as indicator in the 25/8 stock, and the gene vermilion in the 26/8 stock).--The structure of the 26/8 stock was checked cytologically.

Malinovsky, A.A., Inst. of Experimental Biology, Moscow.
The role played by chromosome inversions in the evolution of populations.
(15:29 - 31 in original DIS)

1. Many related species differ from one another by inversions. On the other hand, many species are heterozygous for inversions (Dubinin, Sokolov and Tiniakov, Sturtevant and Dobzhansky, Dobzhansky and Queal, etc.). Is the divergence of karyotypes always the result of the divergence of species, or are the karyotype changes sometimes primary in their nature? What is the typical fate of an inversion in a population?--2. The fate of an inversion in a population has been studied in connection with (1) the cessation of crossing-over in an individual heterozygous for the inversion, and (2) the appearance, distribution and selection of gene mutations. Inversion signifies the one of the two orders of genes which is primarily of the lowest frequency.--3. The number of useful mutations spreading in every chromosome form is approximately proportional to the concentrations of this form, and normal forms therefore accumulate more useful mutations. (a) If a useful mutation has on the average a higher coefficient of selection in homozygous condition that in heterozygous (recessiveness), the inversion is gradually eliminated by the better adapted normal form. Two possibilities exist (1) A normal homozygote is better adapted than a heterozygous inversion (heterosis is low), inversions are eliminated instantaneously. (2) Heterozygous inversions are better adapted than normal form (heterosis is great). An equilibrium of frequencies results, but the accumulation of new useful mutations shifts the equilibrium to the advantage of normal forms. Both these cases occur apparently very often. They explain the presence of low inversion frequencies in species with extensive populations where selection predominates over change frequency fluctuations (b) But if every separate mutation is on the average more useful in heterozygotes than in homozygotes a frequency equilibrium becomes established for inversions. Equilibrium is shifted with the accumulation of new mutations and attains a limit of 0.5.--4. The occurrence, chance frequency fluctuations and the selection of harmful mutations lead to frequency equilibrium (according to Sturtevant and Mather) owing to selection in favour of heterozygous inversions. However the point of view of these authors that selection tends to equalize inversion frequency and normal forms is erroneous. Equilibrium only fixes the initial frequency, although not very firmly.--5. (a) The conclusions of Sturtevant and Mather may be justified only in case it is assumed that harmful mutations displace their normal allelomorphs by chance so that (1) separate harmful mutations invade the whole class of chromosomes (inverted or normal) and become fixed there; (2) The number of harmful mutations in chromosomes of different mutations is equal. But such conditions are hardly possible (except in small populations). (b) But if this takes place permanent heterozygotes may be formed. Disturbances of crossing-over which hinder the passing of harmful mutations from one chromosome class into another prevent complete degeneration which is possible in small populations (Wright, etc.) and assure the preservation of adapted heterozygous forms.--Conclusions: 1. As selection does not favor classes small in number (sec. 3a) the spreading of inversions is mainly the result of chance causes (undirected frequency fluctuations, chance inclusion of a specially useful mutation, etc.).--2. In more isolated smaller populations greater inversion frequencies may be expected.--3. Permanently heterozygous species (Dubinin, Sokolov) may apparently arise in three ways: (1) If the accumulating mutations are more useful in heterozygotes than homozygotes (sec. 3b); (2) If harmful mutations practically attain 100 per cent in relation to the inversion frequency or the normal chromosome form (sec. 5a and b); (3) If the forms differ from one another by inversions and give hybrids which have high heterosis.--4. Inversions may contribute to the divergence of varieties in two cases: (1) if two varieties

live in adjacent regions but under different conditions. Here the difference in respect to an inversion inhibits the diffusion of useful genes from one region into another where they are harmful: the inversion unites small mutations into a large complex which perishes much sooner when it enters a region to which these mutations are not adapted. The mutations perish sooner because the coefficients of the selection of mutations are summed up. This prevents the levelling of genotypes of contiguous genotypes. (2) if an inversion and a normal form have accumulated recessive useful mutations the heterozygote for the inversion is less well adapted. In this case it is not the best adapted form which necessarily spreads but the one whose product of frequency and coefficient of selection is higher $(\bar{P})$.

As inversion frequency varies some populations are invaded by a normal chromosome and others--by an inversion. Mutation complexes containing an inversion differ from those with a normal form..--Appendix--1. Selection of the inversion (I) $\Delta P = PQ[P(\alpha-\gamma)-Q(\beta-\gamma)]$

(II) $\bar{P} = \frac{\beta-\gamma}{\alpha+\beta-2\gamma}$

$\bar{P}$ stable when $\gamma > \alpha$; $\gamma > \beta$; unstable when $\gamma < \alpha$; $\gamma < \beta$. In the latter case $\Delta P > 0$ if $P > \bar{P}$ and $\Delta P < 0$ if $P < \bar{P}$. 2. The influence of the accumulation of useful mutation (III) $\Delta\alpha = \psi P$; $\Delta\beta = \psi Q$ If the initial coefficient of selection is $\alpha = 0$; $\beta = 0$; $\gamma = 0$, then (IV) $\bar{P} = 1-K-P$ If the initial mutations are $\alpha \neq 0$, $\beta \neq 0$ and $\gamma \neq 0$ but $\gamma > \alpha$; $\gamma > \beta$ and $P = \bar{P}$ then (V) $\bar{\bar{P}} = \frac{P(1-\theta)+\theta(1-K)}{1-\theta+2\theta(1-K)}$ where $\theta = \frac{\psi}{\alpha+\beta-2\gamma}$

3. The accumulation of harmful mutations: A. It is assumed that mutations undergo chance frequency fluctuations, which are equal in both chromosome classes (Pi attains an equal percentage of mutations which have arisen in the inversion and in the normal chromosome).--(VI) $\Sigma\alpha_i = \eta_i P_i\left(2\delta_i + \frac{P_i(\delta-2\delta_i)}{P}\right)$; $\Sigma\beta_i = \eta_i P_i\left(2\delta_i + \frac{P_i(\delta-2\delta_i)}{Q}\right)$;

In this case (II) $\bar{P}' = \bar{P}$

B. It is assumed that harmful mutations may undergo chance distribution and fixation in an inversion and in a normal chromosome without any inhibition from selection.--(VII) $\Sigma\alpha = \Psi P\frac{1}{P\cdot 2N} = \frac{\Psi}{2N}$; $\Sigma\beta = \Psi Q\frac{1}{Q\cdot 2N}$; $\Sigma\gamma = \frac{\Psi K}{N}$

In this case (II) $\bar{P} = \bar{Q}$

P - initial inversion frequency, $\bar{P}$ - inversion frequency of equal value, $\bar{\bar{P}}$ - same in the next generation.

Q, $\bar{Q}$, $\bar{\bar{Q}}$ - corresponding values for a normal chromosome; α - coefficient of selection for a homozygous inversion; β - coefficient of selection for a heterozygous form; γ - coefficient of selection for a normal form. (the coefficients of selection have been taken as regards the conditional level of initial adaptability). $\bar{\alpha} = \alpha-\gamma$; $\bar{\beta} = \beta-\gamma$ and α_i; β_i coefficients of selection of the same chromosome classes in so far as they depend on the mutations of the i category ($\Sigma\alpha_i = \alpha$; $\Sigma\beta_i = \beta$; $\Sigma\gamma_i = \gamma$).

P_i -random frequency (as regards the population as a whole).--Harmful mutations by chance of this frequency are placed into category i. δ -average coefficient of selection of mutations belonging to category i in homozygous condition; δ_i - average coefficient of selection of mutations belonging to category i in heterozygous condition; Δ - growth of value during one generation; K - average gene manifestation in a heterozygote; as compared to a homozygote.-- ψ - coefficient of proportionality showing the increment of adaptability in its dependence on the occurrence of useful mutations; η_i - number of mutations in category i.-- Ψ - average number of harmful mutations per chromosome arising during one generation multiplied by their average coefficient of selection in homozygous condition.

Masing, R.A., Pavlov Biol. Inst. Koltushi, Leningrad.
Different viability of heterozygotes for lethals in D. melanogaster.
(15:31 - 32 in original DIS)

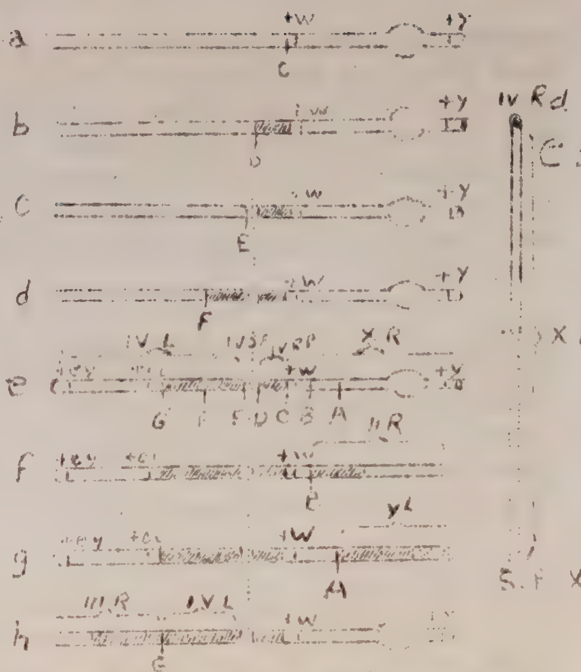
Comparative viability of flies heterozygous for different sections of chromosome (with the lethal and without) obtained as a result of crossing-over, has been studied in three stocks. In all the stocks flies heterozygous for a section of the chromosome containing no lethal showed no increase in viability. Increased viability of flies heterozygous for a section of the chromosome containing the lethal was observed in the progeny of all individually studied crossover males carrying the lethals in the stocks 627 and 15MF. This suggested that in these stocks either the lethal itself was a dominant gene of increased viability with recessive lethal effect or that there was a dominant modifier located near the lethal.--Apparently the increased viability of flies heterozygous for the lethal in stock T201 is due to interaction between the lethal gene and a dominant modifier located so far from the lethal that crossing-over between both genes is frequent.--In two sets of experiments increased viability of heterozygotes for lethals was met with in four cases. Semidominant lethal effect (i.e. low viability of heterozygotes for lethals) was observed in 24 cases.--14 stocks studied contained different lethals which originated spontaneously and under the influence of a chemical agent in laboratory stocks. The viability of heterozygotes was determined by means of crossing Cy/l males with ebony and normal females from inbred stocks.--Not a single case of decreased viability of heterozygotes for lethals was observed. Increased viability in the heterozygous state was observed in seven stocks, the results being similar when crossing with ebony females and normal females. In 5 stocks increased viability of heterozygotes was observed only when crossing these males wither with ebony females or with normal females. The results obtained in this work are not sufficient to explain this peculiar effect.--In some cases lethals are not indifferent to the life of heterozygotes. This suggests the important role of selection among heterozygotes in alteration of concentration of lethals in populations, such selection being either positive or negative.

Neuhaus, M. E., Genetical Lab., Moscow State Univ., Moscow.
Relation between the length of the X-chromosome of D. melanogaster and the frequency of X-ray translocations.
(15:32 in original DIS)

Two hypotheses were proposed to explain the mechanism of structural changes of chromosomes induced by X-rays. One is the breakage hypothesis of Stadler (1932); the other is the crossing-over or contact hypothesis proposed by Serebrovsky (1929). Some indirect data speak for the second hypothesis.--In studying the mutation process induced by X-rays (dosage 4000 r) in X, XY^S and XY^L spermatozoa (Neuhaus, in press) there was found 2.93±0.65% of translocations between the X-chromosome and the autosomes in X-bearing spermatozoa, 6.98±1.04% in XY^S-bearing spermatozoa, and 10.00±1.25% in XY^L-spermatozoa. The percent of translocations between the autosomes in X-bearing spermatozoa was 10.59 (n=670), while in XY^S spermatozoa it was 9.65 (n=601) and in XY^L spermatozoa 11.89% (n=580).--The above data are difficult to explain from the stand-point of the breakage hypothesis. According to this hypothesis breaks occur independently from one another and, the breaks having occurred, the fragments rejoin at random. If this is the case we must expect a decrease of the percentage of translocations between the autosomes in XY^L spermatozoa as compared with that in XY^S and X spermatozoa, and in XY^S as compared with X-bearing spermatozoa. But this is not the case.--The above data are easily explained by the contact hypothesis. The increase in the length of the X-chromosome leads to an increase in the volume of the nucleus of the spermatozoon, therefore more quanta of X-rays are absorbed. The increase in the length of the X-chromosome does not influence the interrelation and the frequency of mutual contacts of the autosomes, hence the percentage of translocations between the autosomes remains the same. In XY^L and XY^S spermatozoa the frequency of contacts between the X-chromosome and the autosomes is increased and so is the number of quanta absorbed, and therefore it is to be expected that the percentage of translocations between the X-chromosome and the autosomes must rise.

Olenov, I.M., and Kharmac, I.S.,
Leningrad: State Roentgeno. Inst.
Transformation of normal genotype in wild *D. melanogaster* populations.
(15:32 - 33 in original DIS)

The results of the analysis of a wild population of *D. melanogaster* together with existing literary data led us to suggest that the process of inclusion of mutant genes into a normal genotype is of common occurrence in wild *D. melanogaster* populations. Our aim was to verify the exactness of this suggestion. With this purpose we studied all the visible mutations belonging to the 2 chromosome, that in the summer and autumn of 1938 came to our observation in the Uman population as well as all the visible mutations in the Bebrov population (Voroneg region) and in that of Simferopol (Crimea) analyzed at the same time.--We paid special attention to such characters which, while appearing in some strains as the sole recorded change occur at the same time as a peculiarity accompanying the principal manifestation of other genes, because many visible mutations belong to the number of activators of the gene, included as an effect of selection into the normal genotype. Additional to the changes in the posterior crossvein five alterations, presenting an analogous picture of inheritance, were brought into evidence. Four of these (not unfolded wings, divergent wings, indentations in the inner edge of the wing, dachsoid legs) are incompletely manifested similar to the abnormality in the posterior crossvein. The same four alterations we frequently have noted as a part of the pleiotropic effect of other visible mutations. The strains in which all these five alterations have been observed together with changes in the posterior crossvein are found in 50 to 60% of all chromosomes that contained visible mutations.--We consider that by natural selection mutant genes are simultaneously included into the normal genotype of wild *D. melanogaster* populations, that the transformation of the normal genotype is a mass process continuous in its occurrence. The transformation of the normal genotype occurs no doubt not only at the expense of visible mutations; of great importance are the transgenations which produce no phenotypical changes recognizable on application of the sampling method habitually employed. Such a conception of the normal genotype represents, we should say, a certain progress as compared with the generally accepted view according to which the normal genotype is considered to represent a relatively stable system. The origination of new varieties and races, the starting point of the species producing process, appears to us not as a movement beginning in every case from some stationary point but as an occasionally originating and necessary result of the action of natural selection which uninterruptedly transforms the normal genotype.



Panshin, I.B., Inst. of Experimental Biol., Moscow.
The role of heterochromatin in the position effect of the white (mottled) and cubitus interruptus genes.
(15:33 - 34 in original DIS)

A translocation (involving the X and 4 chromosomes, causing the w^{mt} position effect) favorable for the study of the w^{mt} and ci position effect in the same chromosome was used for obtaining (through X-ray treatment) secondary rearrangements which change the mode of variegation of the white gene and call forth the position effect of ci. The structure of this translocation (designated as w^{mtll}) is shown in the diagram (e_1,e_2). It is clear that a mutual translocation has occurred between the X (break to the right from the $3C_2$ double band) and the right arm of chromosome 4. The diagram shows that rearrangements of different structures were tested (obtained from w^{mtll} original rearrangements and more complicated cases derived from X-raying of secondary rearrangements, in all 45 rearrangements) in which the quantity of heterochromatin connected with the white gene was changed. It was found that the more heterochromatin is associated with the w gene within one chromosome, the fewer pigmented cells are present in the eye, i.e. there is an inverse proportionality between the quantity of heterochromatin and the number of cells in which the action of the w gene remains unchanged (diagram). Diagram a represents the normal X or the absolute reverse from w^{mtll}; b and c--the almost normal eye, d--the dark w^{mt}; e—(the w^{mtll} original stock) the relatively light w^{mt}; f and g--few pigmented cells; h--absolutely pigmentless stock which give w^{mt} with an extra Y.--Note that variegation does not depend on the position of the w gene as regards the chromocenter, but only on the quantity of heterochromatin connected with the gene within the chromosome, since (1) the mode of variegation is equal in the structures b and c, whereas in b white is removed from the chromo-center and in c--connected with the spindle fiber (i.e. with the whole chromocenter), and (2) in c, d, e, f, g, h--the position of the gene with respect to the chromocenter is the same, but the number of pigmented cells decreases with the increase of the quantity of heterochromatin within the chromosome connected with the gene.--It is clear that all the heterochromatic regions of the chromosomes are identical (except X and Y) in their action on the w gene and each heterochromatic region can be divided without any loss of its qualitative properties. The inert region of the X and probably the Y-chromosome consists of two parts; the proximal regions being homologous to the autosomal heterochromatic region, the distal ones to the active regions.--A comparison of the causes underlying the secondary position effect of the w gene (variegation changes as a function of heterochromatin quantity) and the primary position effect of the ci gene (decrease of dominance of the normal allelomorph) shows that these causes are similar, or even identical. In both cases the changes of the gene effect are caused by changes of the connection between the gene and the heterochromatin within the chromosome. This conclusion, which has also been reached by W.W. Khvostowa for the ci gene, is confirmed by the fact that in the w^{mtll} chromosome the breaks in the IVL inert region with subsequent translocation to the active region almost always change both genes (w and ci). This illustrates the dependence of both genes on a third element (IVL inert region). The action of the ci gene should also depend on the quantity of heterochromatin connected with the gene, since qualitative observations indicate that an inverse correlation takes place between the degree of reversion from w^{mt} to the normal phenotype and the manifestation of ci in translocations of the w^{mt11} chromosome.--The single quantitative interdependence between the gene action and the quantity of heterochromatin connected with the gene can be considered as an indication of the chemical reaction between the genes and heterochromatin products involved, and corresponds in general to the chrmical hypothesis of Muller and Offerman of the position effect. This conclusion corresponds to the findings of Schultz and Caspersson that nucleic acid is of great significance for the position effect caused by the heterochromatic regions.

Prokofyeva-Belgovskaya, A.A., Inst. of Gen. of the Acad. of Sci. of the USSR, Moscow. Cytological properties of inert regions and their bearing on the mechanisms of mosaicism and chromosome rearrangement.

(15:34 - 35 in original DIS)

The fundamental structural element of a chromosome is a chromiole with the adjacent section of a chromonema, the loci of individual genes being connected with both of them.--"Heterochromatin" and "euchromatin" are not present as specific substances in chromosomes, but any chromosome section can assume a "heterochromatic" or "euchromatic" condition. An intimate conjugation of chromonemata and the presence of thymonucleic acid in chromioles only are characteristics of a "euchromatic" condition of a chromosome section. A weakening of the conjugational properties of chromonemata and the appearance of thymonucleic acid in chromonemata are characteristics of a "heterochromatic" condition of a chromosome section. As a result, the latter assumes diffuse structure. The euchromatic condition is usually characteristic of active sections of chromosomes, whereas the regions situated near the spindle fiber attachments ("inert" regions) are more frequently found to be in heterochromatic condition.--An approximation of a euchromatic active region of a chromosome to the region of the spindle fiber attachment leads to its transformation into a heterochromatic region. It can be made to revert again into the euchromatic condition by the influence of internal (additional inert regions) or external (temperature) factors.--A small heterochromatic inert region inserted between two active regions assumes the euchromatic condition. All this indicates that chemical processes responsible for the euchromatic or heterochromatic condition of a chromosome section are reversible. When in euchromatic condition, inert regions are incapable of inducing a heterochromatic condition in the adjacent sections.--A change of the euchromatic condition of an active section into the heterochromatic one is accompanied in mosaic strains by a change in the expression of characters controlled by a given chromosome section, this change being most frequently from the dominant expression to the recessive one. When the section in question again assumes the euchromatic condition (influence of the Y-chromosome, temperature) the expression of the corresponding character also becomes changed and it develops into the dominant form.--Consequently the course of development of a given character in a mosaic individual depends at a particular moment not upon the presence or absence of a chromosome section containing certain genes, but upon its definite condition, the latter having definite morphological and chemical characteristics.--Inert regions are specific chromosome sections containing many loci homologous to one another ("multiplications"). The mutual attractions of these loci is usually described as a non-homologous conjugation of chromosomes.--An investigation of the behavior of different sections of the X-chromosome at conjugation led to the discovery of the presence of "inert" regions in the following sections: 1A1-3, 2B, 3C3-3C6, 4C3-7, 7C, 8C, 9B, 11A 11CD, 12EF, 15F, 17A, 19E3-4, 20A-F. In contrast to other parts of the X-chromosome, all sections mentioned above have a tendency to conjugate with one another.--Distal "inert" regions apparently represent a fundamental feature of the primary organization of a chromosome just as the inert regions located near the spindle fiber attachments do. The nature of "interstitial inert regions" is not clear as yet.--A comparison of the distribution of the best-known breaks in the X-chromosome (inversion sc^8, sc^4, y^{3P}, w^{M4}, rst^3, ClB, dl49, B^{M1}, B^{M2} and nine breaks of the inversions studied by Hoover, 1938; translocations W^{m5}, w^{mMed}, etc.) with that of the inert regions showed that all these breaks had occurred in inert regions or in their immediate vicinity.--A study of the distribution of 141 cytologically detected X-chromosome breaks obtained in the course of another experiment by N.P. Dubinin, V.V. Khvostova, and V.V. Mansurova, clearly showed that the distribution of breaks was not at random. Although a chromosome can be broken in any point the breaks in inert regions are relatively much more frequent than in the active ones. For example, 8 breaks were found in 11A, 9 in 11CD, 6 in 19E, etc.; the probability of chance occurrence of 6 breaks within just one section was in this experiment 0.00105 and that of 8 breaks only 0.00002. The greatest number of breaks was found in sections 11 and 12 where inert regions represented by sections 11A, 11CD and 12EF are also clustered.--The data obtained lead to the conclusion that the property of inert regions of conjugating with one another must be a very important factor in the mechanism of chromosome rearrangement. The increased breakability of a chromosome in the inert regions ("weak spots" being especially characteristic of sections 11A and 19E) is also of importance. It can be due either to the peculiarities of chemical structure of inert regions, or to a conflict of forces of attraction. Both the property of conjugation and the breakability are evidently important factors in the process of rearrangement and both hypotheses proposed to account for the process - the independent breaks and the contact one - may be correct. The second, however, seems to the author to be more plausible.--Most of the frequently mutating genes of the X-chromosome are located near the inert regions. Such are: yellow (inert sections 1A-1-3), white (inert section 3C3), cut (inert section 7C), lozenge (inert section 8C), forked (inert section 15F), and bobbed (inert section 20C). This does not seem to be a mere coincidence. Considering this fact in connection with the increased frequency of X-ray mutations in chromosome sections approached to inert regions as a result of chromosome rearrangements, and with the somatic variability of characters depending upon genes located in such sections (mosaicism), we are justified in suggesting that the spontaneous mutability of genes is also somehow related to their position with respect to inert regions.

Rapoport, J.A., Inst. of Experimental Biology, Moscow.
Multiple linear repetitions of the Bar gene.

The changes to ultra-Bar, often found by Zeleny in Bar stocks, were explained in 1923 by Sturtevant and Morgan as a double repetition of the Bar locus caused by unequal crossing-over. New proofs of this explanation were given by the subsequent investigations of Sturtevant (1925-1928). Sturtevant and Thompson did not succeed in their attempts to obtain more complex repetitions than double Bar, and in order to explain this failure Sturtevant assumes that such structures are sterile or poorly viable whereas Thompson assumes that the lower limit of the number of facets of the Bar type eye is attained in double Bar and that the addition of new Bar genes can diminish the eye no more.--As it is possible to compare approximately the action of a definite temperature with that of a definite number of Bar genes, a prognosis of quadruple-B was made by determining the temperature reactions of B^d. This prognosis was justified later on.--However, in view of the possible transgression of B^d with B^q the search for B^q was made not in the stock with free X-chromosome, but in the B^dB^d stock with attached X's.--It was assumed that if a B^qB^+ female were to arise following unequal crossing-over in this stock (even not being phenotypically different from her B^dB^d sibs) she could be identified by her B^+B^+ daughters which are bound to arise from equal crossing-over in the progeny of B^qB^+ females.--Quadruple-B was found after 8237 cultures had been investigated (with 25-35 females in each culture). The homozygous B^q has 8-12 facets, and the heterozygous 24 facets.--At the beginning the B^q males were sterile but when the mutation yellow was eliminated fertile B^q males appeared.--In extensive experiments on unequal crossing-over in B^q/B^d stock sextuple-B was found with 17 facets in $B^s/+$ heterozygotes (no homozygotes were obtained).--B^q contains 5 and B^s 7 regions 16A 1-4 in the salivary gland chromosome. In extensive experiments on unequal crossing-over in the homozygous stock of B^q, a crossover female with 4 facets was obtained. Probably it was a heterozygous octuple B. This female left no progeny.--The structure infra-B^q with 19 facets and a fourfold repetition of a new allelomorph of B with 8 facets was obtained. Structures similar to B^d, B^q etc. may be looked upon as a special kind of chromosome aberrations. The linear repetitions of B are instances of experimental polymery. The position effect which was found by Sturtevant does not increase in more complex Bar structures. An analysis of the curves which characterize the number of facets in different B structures shows that each doubling, each multiple increase of the number of B genes inhibits one or two divisions of the facet forming cells. The coefficient of dominance of different B structures has been determined. The reduction of ocelli in B^q has been investigated in connection with the problem of the field of action of a gene. The frequency of crossing-over on the distal and proximal limits of B^q repetitions has proved to be equal, which gives some genetical data on on the dynamics of conjugation along the chromosome.--Unequal crossing-over between different allelomorphs of Bar has also been investigated.--Non-crossover reversions of a new B allelomorph caused by a mutability-increasing gene have been studied. On the basis of the data obtained, it is possible to think of the changes of B as not affected by alteration of gene balance, because in the structures which retain several insertions of 16A 1-4 the character B disappears after such a mutation although the gene balance remains intact.--X-rays (more than 20,000 individuals from irradiated fBBx/+ females were studied) did not cause unequal crossing-over between sister chromatids. In order to elucidate the problem of the simultaneous mutation of neighboring genes the effect of X-rays on the B^q structure was studied. Simultaneous reverse mutations in the four regions of B did not appear. Simultaneous changes in two regions were found and are most frequently a result of the position effect, but not of a simultaneous mutation.--In general the B locus shows changes both of the mutation and of position effect types and there is no ground for explaining all the changes by either of them.--In view of a number of traits common to Bar and Hairy wing, an investigation of unequal crossing-over and a cytological investigation were carried out in the stock y Hw. Unequal crossing-over does not occur, but a duplication was found in the salivary glands.

Sacharov, W. W., Inst. of Experimental Biol., Moscow.
The mutation process in ageing sperm of D. melanogaster and the problem of the specificity of the action of the factors of mutation.

In a number of papers (1935, 1936, 1938) the author has expressed his point of view that external mutation factors cannot be looked upon as "action accelerators" only. The question arose as to the specificity of the action of external factors, which remains latent in the qualitative peculiarities of the mutation process. The cytogenetic study of lethal mutations occurring (1) under the action of X-rays, (2) spontaneously and under the action of chemical factors, showed that the second are devoid of those chromosome aberrations which characterize the first. However, it was necessary to obtain material on spontaneous lethals arising in mature sperm in order to show that the character of the mutation process depends not only on external factors but on the peculiarities of those stages at which they occur. The author chose the mutational action of ageing sperm. ClB females fertilized by forked males were isolated from the males. The experimental and control flies were obtained from the same females. the only difference being that the control consisted of eggs laid during the first days after the female was inseminated while the experimental eggs were laid 30 days and often longer after insemination. Throughout these 30 days the females were placed without the males on a poor diet at 18°C. and were transferred later onto a normal diet.

Table 1

	Number of initial females	Number of analyzed chromosomes	Mutations				Remark
			Lethal	Semi-lethal	Total	Percentage	
Experiment	271	2804	18	$6^{x}/$	24	0.856±0.174	$^{x}/$ Among them--3 with visible manifestation.
Control	306	6327	11	$4^{x}/$	15	0.237±0.184	$^{x}/$ All 4 with visible manifestation
				Difference		0.619-0.184	

The increase of mutation frequency of 3.6 times (Ratio = 3.36) and the regularity of the occurrence of mutations leave no doubt that the majority of new mutations had occurred in mature sperm.--A cytogenatic analysis was carried out for 21 cases and a small deficienty was established for one lethal only; in the other 20 cases no cytological changes were found. Lethal and semilethal mutations occurring in mature sperm do not differ apparently by their structure from the general group of spontaneous mutations which might have occurred at all stages of spermatogenesis. Note that the majority of gene mutations occurring when the sperm is ageing are located on the right side of the chromosome, while spontaneous mutations of the usual control (131 lethals) are irregularly arranged along the entire chromosome length.--The author attaches great importance to the accumulation of mutations in ageing sperm. He considers that this process contributes to the comprehension of the mutation processes occurring in wild populations. At present the author is therefore studying the mutation process in the sperm of hibernating males and in the sperm which is retained in the hibernating females. Males and fertilized females (isolated from each other) were kept at 5-7°C. for several months. Under these conditions the flies remain immobile.

The majority of flies perished, a small number of flies survived and gave F_2 when the ClB method was applied. The following results were obtained.

Table 2

	Number of initial flies	Number of chromosomes investigated	Mutations	
			Number	Percentage
Hibernating from 38 to 50 days	179	2238	9	0.402±0.13
Hibernating 62 days	39	1325	5	0.38 ±0.17
Control	104	5504	9	0.164±0.055

The investigation was carried out on the 80th generation of the forked stock carefully inbred by the author, while in table 1 the data are given which describe the 50th generation of the same stock. Note the general decrease of the frequency of spontaneous mutability which has been found by other investigators analyzing the forked stock.

Sidorov, B.N., Inst. of Experimental Biol., Moscow.
A study of the nature of mosaicism in the inversion scute^8 of *D. melanogaster*.

In flies carrying the inversion sc^8, as well as other aberrations connected with chromosome breaks in the inert region, a mosaic manifestation of genes may be noted which, owing to aberrations, approaches the inert substance. In this inversion mosaicism for the yellow and achaete genes is noted. Investigations on mutations caused by X-raying the sc^8 chromosome have led the author to the assumption that mosaicism is due to some kind of hereditary change of the *y ac* loci in the soma (Sidorov, 1936). Patterson's point of view that these changes are deficiencies of the entire left area of the chromosome was refuted by a number of facts. In order to prove my point of view it was necessary to follow up the spontaneous changes of the *y ac* loci in the inversion sc^8.--In the progeny of sc^8 males crossed with *y* sc^{13} females, a great number of lethal *y ac* mutations was found. The mutations arose with a frequency of 1:5,689 chromosomes. The majority of these mutations were caused by crossing-over between the distal region of the inert substance in the sc^8 inversion and the short arm of the Y-chromosome. Of the seven *y ac* mutations only one lacked a piece of the short arm of the Y-chromosome on the distal end of the X-chromosome. An additional class of sc^{13} was discovered. A special experiment was undertaken to obtain an additional crossover class to the "*y ac* mutations" which consists of a Y-chromosome with a left end of the X-chromosome containing the normal

Sokolov, N.N., and Dubinin, N.P.,
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Permanent heterozygosity in drosophila.

In the south of USSR, a *D. species* was found which was named *D. obscura-3.* The chromosome set of this species contains five pairs of rod-shaped chromosomes and one pair of microchromosomes. --Forty-one stocks were bred from females fertilized in nature and caught in Baku and Sukhumi in 1936, in Sochi, Sukhumi and Novorossiisk in 1937, in Simferopol and Sochi in 1938. The investigation of the salivary gland chromosomes showed that every stock contained several chromosome aberrations. The aberration set was identical in all the populations.--The following chromosome mutations were found in the Sochi population:

Chromosome	Chromosome mutations	Percentage of stocks heterozygous for various aberrations	Remark
2	Inversion "A"	66	
3	Inversion "B"	45	
4	Complex rearrangement "A"	91	overlapping inversion
5	Complex rearrangement "B"	100	

All the stocks from the other populations proved also to be 100 per cent heterozygous for the complex rearrangement in chromosome 5. In spite of inbreeding carried out during 7-8 generations no homozygous forms were obtained in the overwhelming majority of stocks. However, a cytological study revealed both hetero- and homozygous chromosomes of every pair in the larvae of every given generation.--Direct proofs of the existence of a mechanism of balanced lethals for one of the chromosomes were obtained in the following way. Among the inbred stocks one proved to be homozygous for the chromosome of the fifth pair. The stock was used as analyzer in a cytological study of segregation. One hundred and one males taken from several stocks of *D. obscura-3* were inbred for seven generations and then crossed with females from the stock homozygous for the chromosome of the fifth pair. One hundred males were heterozygous and only one homozygous for the chromosome of the fifth pair. It is therefore clear that the overwhelming majority of individuals is heterozygous for one of the chromosomes. It is only exceptionally, possibly through crossing-over, that homozygous individuals occur. The homozygous forms apparently perish mostly during the larval and pupal stages. If this is right, the introduction of a chromosome devoid of lethals from a homozygous stock will disturb the system of balanced lethals and will cause the occurrence of homozygous forms among imago. This hypothesis has been experimentally proved by us.--The above facts point to the conclusion that we are dealing with permanent heterozygotes. At the bottom of this heterozygosity lies a system of balanced lethals which is connected with intrachromosome aberrations, inversions; this points to the difference existing between permanent heterozygotes *Drosophila* and complex *Oenothera* heterozygotes. Owing to the difficulties connected with catching the flies of a new Drosophila species whose populations are not numerous and whose area of distribution is limited, extensive investigations have not been carried out. However, our study of wild populations from different localities has given the same results for 3 consecutive years. The assumption may therefore be made that the peculiarities of multiplication observed by us characterize not only the stock studied, but the entire species.

Tiniakov, G.G., Inst. of Experimental Biol., Moscow.
A new case of high spontaneous mutability in D. melanogaster.

The first publications on mutable stocks of D. melanogaster appeared in 1937 (Plough and Holthausen, Demerec, Goldschmidt). In 1938, such a stock was found in Portugal by Valadares, and the author discovered, in 1938, a highly mutable stock in a wild population caught in the fall of 1937 in Khotkovo (60 km. from Moscow).--The problem of mutable stocks in wild populations is of great importance because the existence of these stocks in nature and their possible reoccurrence in natural populations throws new light on the theoretical problems of populations and on the complicated problems of the nature of the mutation process in general. This greatly changes current views as to the possible mutation frequency in natural populations.-This paper gives some results obtained by the author in one mutable stock studied. This mutable stock was bred from 5 females and 4 males caught in nature. Till the fall of 1938 this stock was bred in mass cultures. The frequency of occurrence of certain changes in this stock required additional study. The first investigations showed its high mutability. Up to now 50,437 flies have been individually studied; among them 786 individuals were distinctly changed. The aberrant flies may be divided into 108 independent types (Tables 1 and 2).--The data on the sex chromosome are accurate, because only those characters were taken into account which were found in one individual among 60-70 individuals of a culture. But if 2-3 identically changed individuals were found (a group or "bundle) all the three changes were considered as a single change. Almost all these mutations found in the sex chromosome were identical with corresponding stock mutations.--There may be errors in the frequency of occurrence of separate gene mutations in the autosomes because it is sometimes difficult to know the moment when heterozygous recessives arise. However, the frequency given in the table is in no case higher, but rather lower. In usual wild and laboratory stocks of D. melanogaster (Plough and Ives,1935) and D.funebris (Spencer,1935) 5 visible mutations as a rule occur per 100,000 flies. The spontaneous frequency of occurrence of visible mutations in our mutable stock therefore is 41 times greater than the usual frequency (without recurrent cases). If the recurrent cases are taken into account, the frequency of occurrence of visibles will obviously be 313 times greater than the usual frequency. This frequency of occurrence is therefore twice as high as that caused by X-rays. In this mutable stock, too, such rare mutations as tetraptera, rotated, aristapedia, etc. were found. Such mutations as lobular wings, wings with an extra radial vein, horn-like protrusions on the sides of the body, eight and four-legged flies, females with sex combs, etc.,--are also possibly quite new. The cause of this high mutability apparently lies in the occurrence of some kind of autosome factor in this stock. This factor of mutability is not attached to the X-chromosome because often yellow males and other mutations occur in crosses in which both X-chromosomes do not come from the mutable stock though the autosomes do. Somatic mutations were often observed. Lethal mutations in the X-chromosome of the male are considerably less frequent than the visible mutations in other chromosomes. It is noteworthy that mutable stocks are apparently widespread (R.L. Berg, Dusseeva and Sokolov have found mutable stocks in D. melanogaster in many places in the Ukraine and Crimea(data unpublished)and all these stocks are apparently of the same nature because they invariably follow the occurrence of yellow, plexus, abnormal abdomen, etc. A preliminary cytological analysis of the salivary glands of this stock showed that a disturbance in chromosome conjugation, nonhomologous conjugation and chromosome rearrangements (three cases in our preliminary material) are often found. The majority of the changes obtained are real mutations, because of the 103 types of changes found 39 have already given stocks breeding normally, the majority with 100 per cent manifestation. The newly formed stocks also continue to mutate.

Table 1

Type and Frequency of Occurrence of Mutations in the Sex Chromosome of the Mutable Stock among 50,437 Flies Examined

No.	Character of mutation	Frequency of Occurrence of Mutation		
		♀♀	♂♂	Total
1	yellow	--	57	57
2	lozenge	--	8	8
3	forked	--	7	7
4	miniature	--	7	7
5	white	--	4	4
6	outstretched	--	3	3
7	vermilion	--	2	2
8	scute	--	2	2
9	cut	--	2	2
10	Bar	2	--	2
11	Notch	1	--	1
12	Beaded	1	--	1
		4	92	96

Table 2

Type and Frequency of Occurrence of Autosome Mutations in the Mutable Stock among 50,437 Flies Examined

No.	Type of Mutation	Frequency of Occurrence of Mutation		
		♀♀	♂♂	Total
1	black	24	3	27
2	tetraptera	3	4	7
3	brown	2	3	5
4	aristapedia	2	1	3
5	rotated abdomen	4	2	6
6	plexus	3	2	5
7-47	various wing changes	171	122	293
48-53	various eye changes	38	44	82
54-71	various body and head changes	65	50	115
72-83	various bristle changes	51	31	82
84-91	various leg changes	32	33	65
		395	295	786

Zuitin, A.I., Peterhof Biol. Inst. Leningrad University, Leningrad. The changes in the environment as the principal external factor in natural mutations.

During the last ten years, whenever the problem of the environmental factors producing mutations in nature was taken up for consideration, such unusual factors as the radio-active properties of the earth, the cosmic radiation, or the high tropical temperature, were commonly assumed to be the most probable mutation-producing factors. According to these assumptions cultures of Drosophila were subjected to exotic experiments: they were taken down to the depths of the earth (Babcock and Collins, 1929; Hanson and Heys, 1939), or they were taken high up to the skies (Friesen, 1936; Jollos, 1936 and 1937), or they were exposed to the action of high tropical temperature (37°C) for a more or less long time assuming that it is this temperature or some one thereabouts that must have the expected positive effect in increasing the rate of mutations (Goldschmidt, 1929; Jollos, 1930-1933; Plough and Ives, 1933-1935; Timofeeff-Ressovsky, 1935; and others). An attempt was also made to find a relationship between the Van't Hoff rule and changes in the rate of mutations. (Muller,1928; Timofeeff-Ressovsky, 1935; and others),--A few years ago a work was undertaken by the author, based on a different assumption, namely that it is the most common and usual variable ecological factors, such as temperature, humidity, etc., incessantly accompanying the entire animal and plant world in its evolution, that are capable of producing mutations when they acquire such extreme, more or less contrasting, values as are sub-lethal for a given population, acting usually in two different directions at the same time--both as a mutation -producing factor and as a factor of natural selection.--Considering the fact that sudden, contrasting changes of temperature are quite widespread throughout the world, not only at present but also in the past ages of the earth's history, the experiments planned were undertaken first of all with the temperature factor, both in laboratory and in natural surroundings.--These experiments gave quite a definite positive answer to the question in consideration, as can be seen from the tables published in three preliminary papers by the author (C.R. Acad. Sci. USSR, 1937 and 1938). In all the experimental sets a high death rate of the developing individuals and a high sterility of survived ones were observed. It was found that temperature itself was not the main factor in the effect produced, but that it was a more or less sudden and contrasting change from a certain usual temperature or thermal regimen to a different unusual one, which brought the population to the limits of its vitality. The high sterility of surviving individuals indicates that the germ cells also are brought into a sub-lethal state by such temperature changes. And one may suppose that the spontaneous mutation in constant external conditions, usual for the individual organism, can be produced by accidental sub-lethal combinations of physiological micor-conditions in a particular mutating cell. No definite relation to the rule of Van't Hoff could be observed in our experiments.--Being conscious of a great deal of responsibility for the conclusions made, the author has carried out one more experiment, as follows. The laboratory 'normal, 112' stock with the mutation rate 0.173% was brought from Leningrad to Sukhumi in the summer of 1938. Here the flies were let out of the vials in an orchard, where they fed on putrefying fruit, and were isolated so that any mixing with the local *D. melanogaster* was prevented. During the development of the generation in the experiment the temperature in the fruit substratum varied from 20° to 30°C, while the relative humidity varied from 66 to 100 per cent. On account of a high mortality of the developing flies 620 gametes only could be studied with the ClB method. However, 17 of them were found to contain a lethal or semi-lethal mutation in the X-chromosome tested in F_3. This makes 2.74%, or sixteen times the percentage observed in the same stock in the control laboratory conditions, the difference in percentage being about 10 times its probable error. This rate of mutation was higher than that of the local race in the same natural conditions, whereas in laboratory conditions the relations are reversed.--The effect of humidity on mutation frequency as a factor closely related to temperature for all the land-dwelling organisms is the object of the author's studies at the present time.

Research Notes

Eloff, G. and Nolte, D. J. Appearance of unexpected eye-colors.

Certain unexpected and as yet unidentified eye colors appeared among the f_2 of certain crosses with the y w stock, being the sex-differentiated eye colors pinkish orange in ♂ and a diluted red or shaded reddish color in ♀, with yellow body color. The following were the numbers obtained:

1) 24 ♀ and 8 ♂ among 3063 individuals in the f_2 of a cross y w ♀ x wild ♂.
2) 12 ♂ among 2062 individuals in the f_2 of a cross se♀ x y w ♂.
3) 126 ♀ and 74 ♂ among 12230 individuals in the f_2 of a cross y w ♀ x se ♂.

These color variations seem to breed true; preliminary tests have produced the following results:

1) Diluted red ♀ x y w ♂.
    f_1 Diluted red ♀ , pinkish orange ♂.
    f_2 223 diluted red ♀ + pinkish orange ♂: 55 white ♀ & ♂.
2) y w ♀ x pinkish orange ♂.
    f_1 42 diluted red ♀ + 35 white ♂.

Gowen, J. W. Hermaphrodites in *D. melanogaster*.

A dominant gene apparently located in the third chromosome has appeared in our cultures which causes the insertion of parts of the male genitalia between the anus and ovipositor of adult flies which would otherwise be normal females. These changes extend into the reproductive tract and sex combs. The sex combs of these individuals are much smaller than those of a normal male but are distinct. The reproductive tract may include the presence of ovaries and testes as well as other secondary sexual glands.

The case is of further interest in that super females, despite their three X chromosomes and the tendency of these to push toward the female type, also are carried toward the male. Thus far the changes noted are not so pronounced as those in diploid females but are of the same type.

Gowen, J. W. Possible demonstration of dominant sex-linked lethal in melanogaster.

In connection with our advanced class in genetics one of the students, Mr. Nelson, has found a very interesting case in the mating of a test male to a female carrying one set of irradiated chromosomes and a tester set containing the ClB genes in the sex and Moiré Stubble ebony in the third. The result of this cross led to a progeny of 100 males and no females. Thus far none of these males were beadex, the gene carried by the tester male. They all carry the wild type x-ray chromosome.

Kalmus, H. Survival and weight change of Drosophila mutants and species of different body colors fed on sugar-water mixtures.

Yellow mutants of melanogaster, pseudoobscura, and subobscura died earlier on mixtures containing over 50% sugar (sucrose, glucose or sorbitol) than did wild type flies, while with mixtures containing less sugar there was no difference. Yellow flies lost more water than wild type on high concentrations, but did not differ on low concentrations. Black and ebony melanogaster died earlier at all concentrations, but the differences were somewhat less at high concentrations. Comparing melanogaster, funebris and pseudoobscura, the last gained weight and lived longer on mixtures rich in sugar, where melanogaster lost in weight. Melanogaster lived longest on solutions containing 2-5% sugar, and funebris was intermediate. At its optimum concentration pseudoobscura lived longer than the other species at their optimum. These observations accord with some ecological rules regarding the relation between cuticle color and the water supply and humidity of the environment (Nature 148, p. 428).

Muller, H. J. Locus of Pale-lethal.

Owing to the fact that the small section removed from the right arm of chromosome 2 in Pale translocation was for years assumed to be terminal, it had been thought that the lethal effect which this translocation has when homozygous was due to a small deficiency or position effect on a gene located near the break between arc and plexus. Since, however, the section removed is an interstitial one (even though the right-hand break is very near the right end of the chromosome) the lethal would, so far as evidence reported thus far is concerned, be just as likely to be near the right as near the left break. That it is not near the left break has now been shown by the obtaining of individuals homozygous for Pale translocation which have the region of the right break, but not that of the left break, covered by the section of chromosome 2 inserted in the Y obtained by Dempster. This inserted section has both its left and right breaks to the right of those of the Pale section; it fails to cover plexus (but, as Dempster found, covers brown), and it covers the lethal. Tests are under way to determine whether it also covers the Pale eye effect (dilution of eosin) found by Bridges. That this is probable is indicated by the fact that single crossers between Plum-1 and normal, having the left end of the normal and the right end of the Plum-1 chromosome and being thus deficient for a small terminal piece of 2R, have a Plum eye color considerably paler than usual for Plum-1. Probably then the pale eye color is due to hypomorphism of a haplo-insufficeint gene near the right-hand break of Pale, and the lethal effect to hypomorphism of another gene very near to this or of the same gene. These genes would be to the right of all those listed in the map of 2, except possibly the extreme Minute.

Muller, H. J. Insertional Translocation involved in "In(dp)"

Though described as consisting of structural changes composed only of a complex of inversions, "In(dp)" proves to have a section of the left arm of chromosome 2, located very near the centromer, attached, presumably by insertion, to chromosome 3. Individuals haplo-deficient for the section are quite inviable; those with three doses ("duplicational") are morphologically recognizable by their arched wings, etc. and have low viability, imaginal vigor, and ♂-fertility; females are sterile. The section in question includes the locus of purple and of other genes nearby. In our formulae, we designate the deficiency in 2 as pr^- and the insertion in 3 as pri. Tests of the location of pr^1 in 3 are under way; it crosses over freely with genes in the region of ebony and we have stocks of this deficiency and insertion combined in the same chromosomes as those of the Pale deficiency and insertion.

Muller, H. J. Viable non-crossover X chromosome.

In order to facilitate work on gene mutations and translocations of the X, a stock has been made up in which the X contains two inversions, one including the other, effectively preventing the obtaining of crossovers (when crossing over is not interfered with in other chromosomes), that has at the same time a fair viability and fertility when hemi-or homozygous, and in which there are two "markers", one dominant and one recessive, that are not likely to interfere with the classification of other genes. This X has the left end of scute 8 and the right end of yellow 3P and hence has the loci of yellow and achaete duplicated (present near both ends), while the locus of scute (near the right end) is hardly affected, the inversion being except for the small duplication like that of scute 8, bobbed$^+$ and block A being at the left. Included in the chromosome is Inversion S, which is similar to but slightly smaller than "delta 49". (In an otherwise normal chromosome the position of the left breakage point of S would be slightly to the right of the position of the left breakage point of dl-49, while that of the right breakage of S would be slightly to the left of the right breakage of dl-49.) The recessive marker is "yellow, dark bristles" as the scute 8 chromosome used had the extreme yellow y^{Si} near its left end and the y^{3P} chromosome has an allele near its right and which gives the yellow dark bristle effect (the darkening affecting mainly the abdominal bristles and epidermal color). The dominant marker included is Bar. Formula: y^{Si} sc^8 B In-S y^{3P}. When heterozygous inversions occur in autosomes, an appreciable frequency of crossovers is obtained, especially of double crossovers in the region of B, spearating B from In-S, but by following both markers, y and B, at once, such crossovers can readily be allowed for in experiments involving the detection of lethals and translocations. This stock is of especial use where it is desired (a) to detect mutations arising in the female in X's of originally normal structure, or (b) to detect mutations arising in both paternal and maternal X's.

Muller, H. J. Stock with marked inversions of all major chromosomes.

The stock with marked non-lethal inversions of the X above described has been combined with stocks having marked inversions in other chromosomes to form the following "marked inversion" or "MI" stock:

y^{Si} sc^8 B In-S y^{3P}; al^2 Cy lt^3 L^4 sp^2/dp b Pm^7; ru h D CXF ca/Sb In 3R

This requires some selection for retaining L^4, as this (but not the associated In(Cy R)) tends to escape by double crossing over; occasionally D also escapes. Many flies are needed to maintain the stock. Without the L^4 it may be maintained much more readily.

Philip, U. Spermatogenesis in Drosophila.

Though spermatogenesis is rare or absent in newly hatched ♂'s, it has been found both in melanogaster and subobscura a few days old. Testes are dissected out and squashed in acetic acid-orcein (LaCour). Previous failures can be attributed to the use of sectional material. Mitoses and meioses are readily observable. In both species X and Y form a chiasma, but autosomes do not. Primary non-disjunction has been observed in both species. Meiosis in XO subobscura proceeds normally, though the spermatozoa may not be motile. In XYY subobscura the three sex chromosomes form a group of 3, but chiasmata have not been observed. This would explain their random distribution.

Pontecorvo, G. Deletions and translocations of X^{c2} (X-rayed).

Translocation 26, T $(X^{c2}:2)26$, covers car and $\overline{bb}$, hom.=1. proximal region of X^{c2} inserted into base 2L. Deletion 1, Del$(X^{c2})1$, free small ring, not yet studied. Deletion A, Del(X^{c2}) A, free ring carrying almost all prox. heterochrom. and distal 1A-F (salivaries by Slizynska). Deletion 38, Del(X^{c2}) 38, free small ring with little proximal heterochr. and 1A-F (saliv. Slizynska). Deletion 40, Del(X^{c2}) 40, free small ring almost as Del 38.

Pontecorvo, G. Drosophila simulans; an X-ray induced deletion. Deletion covering y, Del y+, genetic breaks between y and w, and probably left of bb. mitotic metaph. length about 1/3 to 1/2 of X. Fully viable hyperploid males and females and hybrids with melanogaster. All show slight increase in hairyness. Del. crosses over very easily in females with XX giving X with right arm Dp.

Pontecorvo, G. Age of the females as determing the success of the D. melanogaster x simulans cross. It is well known that the success of mating melanogaster females with simulans males is very erratic. When the females are triploids, the difficulty of obtaining such mating is greatly increased. Schultz & Dobzhansky, who first made the latter cross, obtained about one fertile out of one hundred cultures; Muller and the writer (1940) obtained about one out of three. It is now apparent that a decisive factor in determining the interspecific mating is the age of the females when first put togerher with the males, irrespective of their being diploid or triploid. The interspecific mating occurs without difficulty with females not more than two days old, especially if the males are older and have been isolated for a few days. We have only erratically obtained, and only with diploids, fertile cultures from females put togerher with the males when four or more days old. With young females once the first mating has taken place, successive matings take place until old age. It looks as if the mating reaction of the young female were not fully determined and still liable to conditioning by the male of the different species. No clear conclusions have so far been reached on the reciprocal, and far more difficult, cross of simulans females by melanogaster males.

Pontecorvo, G. Disappearance of bobbed from stocks carrying it. Unsystematic observations on bb stocks in which bb had 'disappeared' suggest that one of the mechanisms of this common occurrence is crossing over in the males between X and Y with production of an XY^L chromosome. As bb+ is carried in the short arm of the Y, this means that crossing over occured left of the bb locus.

Pontecorvo, G. Smoatic crossing over (?) in hybrids between D. melanogaster and D. simulans. It is well known that melanogaster x simulans hybrids die before the imago stage if they do not carry the simulans X-chromosome. We have made preliminary investigations, by Demerec and Hoover's technique, to assess whether the absence of part or all simulans X is also cell-lethal in the imago. Using all possible combinations of yellow and singed, or forked, with their wild type allels on the chromosomes of the two species, consistent results have been obtained showing that in the hybrid females recessive spots appear only of those recessives that are carried on the simulans X and not of those carried on the malanogaster X. If the interpretation generally accepted for the origin of recessive spots in heterozygotes is correct, then we must conclude that the absence of part or all X-simulans is cell-lethal in the hybrids.

Rendel, J. M. Effects of y and wi on mating in subobscura. Matings of 10 x 10 $\frac{y}{y}$ ♀ x y ♂, $\frac{wi}{wi}$ ♀ x wi ♂, or $\frac{y}{y}$ ♀ x wi ♂ impregnate 75-90% ♀s after 7 days. $\frac{wi}{wi}$ ♂ x y ♀ impregnates about 10%.

After brother-sister mating for 7 generations, during which y and wi were kept heterozygous, mating of extracted $\frac{wi}{wi}$ ♀ x y ♂ was still very inefficient. y wi ♂s rarely mate with anything but y wi ♀ and y ♀, though they occasionally do so with some mutant ♀s. No morphological differences have been found to account for this behaviour.

Rendel, J. M., Philip, U. and Spurway, H. Non-disjunction in subobscura. Primary non-disjunction in ♀s can be detected by sex-linked recessive genes such as y. In ♂s it can sometimes be detected by wi, a sex-linked gene whose expression is normally limited to the ♀, but shows up in some at least of XO ♂s. The frequency of primary non-disjunction is about 1 in 4500 in the ♀, and of the same order or higher in the ♂. Progeny of exceptions have been tested cytologically and genetically. The frequency of secondary non-disjunction seems to be under 1%. Patroclinous ♂s have also occured due to a fragment (?deletion) of X covering the locus of y, and matroclinous wi ♂s were not all XO.

Silzynska, Helen Salivary gland chromosome analysis of deleted rings. Ten ring chromosomes in D. melanogaster were studied cytologically; 8 were obtained by Dr. G. Pontecorvo from X-ray treatment of normal ring chromosome (XC2), these are all small deleted rings with centromere. The other two were obtained by Dr. H. J. Muller and were found by genetical means to be translocations between the XC2 and the left arm or chromosome-III. The results are summarized below:

No. of stock DIS-14	Bridges' sections included in the ring	Bridges' length in µ
	Deletions	
35	-sp-f-20-19-18-17A5,6-	62
36	-sp-f-20-19-18-17A5,6-	62
37	-sp-f-20-19-18-17-16F3,4-	65
40	-sp-f-20-1A4-1F4-	28
41	-sp-f-20-1A4-1F4-	28
42	-sp-f-20-1A4-2A1,2-	28.5
43	-sp-f-20.1A4-1F4-	28
	Translocations	
125	-sp-f-20-75C-80D--1A4-2-3...20-	524
126	-sp-f-20-19-18-17A9-75C-76..78-74 -17A6-..1A4-	474.5

Slizynski, B. M. and Helen Slizynska The effects of X-ray treatment of early embryos of D. melanogaster. Experiments which were carried out in order to determine the optimal age of the eggs and the most effective X-ray dosage, have shown that eggs treated with 500 r units at 12-14 hours after laying, contain the highest frequency of changes. They consist of all known types of structural rearrangements. The longitudinal, as well as transversal size variations of these changes exhibit a very wide range. Though the data obtained so far are not sufficient to draw any definite conclusions, the results suggest that the deletions and deficiencies are very often only 'partial'--i.e., only some, and not all the chrononemata which constitute the polytene chromosome of the salivary gland nucleus, are affected.

Spurway, H. Spontaneous X-chromosome mosiacs in subobscura. 1) Gynandromorph. Parents $\frac{y + cd\ cp\ ct^{ar}}{y + cd\ cp\ a}$ ♀ x + cv + + ct^{fr} ♂. Most of abdomen, and genitalia♀ and y+, remainder ♂ and y, But eyes cd+, probably cp, and wings cv* and ct^{fr}(♂phenotype). Internal genitalia ♀, one sterile egg, no sperm, observable in spermatheca.

2) Hermaphrodite or gynandromorph. Parents $\frac{cv\ +\ ct^{fr}}{+\ cd\ +}$ ♀ x cv + ct^{fr} ♂. Head ♂, sex-combs normal ♂, abdomen ♀, genitalia ♀ slightly twisted, eyes and wings +. Internal genitalia in gelatinous, tissue included two pear-shaped testes, two rudimentary ovaries, two spermathecae and a sperm sac. Copulated as ♂ and ♀, but sterile.

3) ♀, in mass culture segregating y and cd. Head, right thorax, legs and wings and dorsal and ventral patches on right abdomen y, remainder y+.

4) Gynandromorph. Parents $\frac{+\ cd\ l_1,\ sin\ ct^{fr}}{cy\ +\ +^{fr}\quad +\ ct^{fr}}$ ♀ x v ♂. Head ♂ aristapedia (effect of ct^{fr}), wings cv ct^{fr} (♂ phenotype), abdomen size shape and posture ♂, number of sternal plates ♀, no external genitalia except ♀ anal plate. Found dead, viscera discolored, not dissected.

Note that mosaicism is usually fore and aft rather than bilateral.

Steinberg, Arthur G. An astonishing gynandromorph. Among the offspring of the following cross: In(1)dl-49, y Hw m^2 y^4/+; $\frac{rucuca}{+}$ ♀ x +; rucuca/rucuca ♂ one fly having the following phenotype was found:

Left side:	Right side:
no sex comb	sex comb present
h or Hw, th st ca	th st cu sr e^s ca
abdominal pigment ♀	abdominal pigment ♂

The external genitalia were ♀. The head was e^s on both sides, the thorax on the right side only. The right half of the thorax was smaller than the left. The cells of the right wing were smaller than those of the left.

This fly was mated to 5 rucuca ♂♂. Fifty-five eggs, none of which hatched, were laid over a period of 5 days (only 2 on the 5th). Upon dissection the internal genitalia were found to be ♀.

Live sperm were found in the seminal receptacle. No simple explanation for the origin of this fly suggests itself, although some rather involved explanations could be offered.

Steinberg, Arthur G. The interaction of hairy and certain X-chromosome characters. During the course of an experiment (done in collaboration with Mr. F. C. Fraser) in which the effect of various X-chromosome inversions on crossing over in the third chromosome was being studied, it was found (a) that the expression of h was greatly exaggerated in the presence of the dl-49 inversion which carries Hw; the exaggeration consists of a great increase in the number of hairs on the veins plus the formation of hairs (bristles?) in the wing cells themselves. In some instances extra veins not connected to those normally present were formed, these extra veins were heavily haired; (b) In(1) sc^8, sc^8, bb w^a also greatly exaggerates the expression of h although in the absence of h, In(1) sc^8, sc^8 bb w^a has no effect on wing hairs and (c) In(1) sc^7, sc^7 w^a suppresses the expression of h. These phenomena are to be examined more closely.

Sutton, Eileen Relation between euchromatin, heterochromatin and mottling. 25 rearrangements with breaks in both euchromatin and heterochromatin have been tested for visible effects of genes in the heterochromatic regions which have been translocated to euchromatin. The loci studied, stocks used for test crosses, and a summary of the results are given in the following table:

Locus	Normal position	♀s with rearrangement mated with -	No. of rearrangements tested	No. showing locus affected
bb	X heterochromatin	X ple ♂s (bb^l)	6	2
lt	2L heterochromatin	Cy/lt std ♂s	5	3
ltd	2R heterochromatin	ltd ♂s	6	? 1
in	3L heterochromatin	in p^p ♂s	5	—
ri	"	ri p^p ♂s	3	—
p^p	3R heterochromatin	in p^p or ri p^p ♂s	8	1

The bb and lt changes appeared in F_1 as mottled types (reduction or loss of some, but not all bristles in heterozygous bb, and a mixture of + and lt tissue in heterozygous lt). The p^p change was not mottled, but showed a uniform coloration intermediate between p^p and -. The doubtful case of affected ltd appeared very slightly lighter than +, and unformly pigmented.

It is clear that mottling is due to a change of environment as between euchromatin and hererochromatin, and can be induced either by translocation of euchromatic genes to heterochromatin (Schultz 1936) or by the converse relationship. This was already indicated by recorded cases for lt (Schultz 1934) and ci (Dubinin et al 1935).

Tan, C. C. Two new karyotypes in Drosophila. From two new species of Drosophila found in China, namely, D. hexastriata and D. mutandis (the descriptions being given by Tan, Sheng and Chang, in press, Science Record), there were identified two types of mitotic chromosome complements, which have as yet not been recognized in any other species of Drosophila. The larval ganglial metaphase plate of D. hexastriata consists of 1 pair of V-shaped, 2 pairs of rod-shaped and 1 pair of dot-like chromosomes in the females. The larger pair of rods represents that of X-chromsomes, since one of these is replaced with a J-shaped Y-chromosome in the males. This is the eighteenth karyotype found in Drosophila and will be known as type "R". Another new karyotype, type "S", has been observed in D. mutandis, which possesses 5 pairs of rods and 1 pair of dots in the female. But 2 pairs of rods are unusual in length, about twice as long as the other 3 pairs. The X- and Y-chromosomes, which are almost indistinguishable from each other, are the largest of the set.

Vogt, Marguerite Further experiments on the species-specificity of the gonadotropic factors in Drosophila species. Ovaries transplanted between the species malanogaster, funebris, virilis and pseudoobscura never develop normally. This fact together with the possibility of stimulating the development of the implanted ovary (by co-implantation of brain-ring-gland-complexes of the same species into the foreign host) in reciprocal combinations supports the hypthosis of species-specificity of the gonadotropic hormones in Drosophila. It is to be expected that this species-specificity may be weakened by greater quantities of foreign hormone. The following experiments favor this hypothesis: ananassae-(Monod and Poulson), vir.-, fun.-and pseudoobsc.-ovaries develop better in fes-females and mel-/sim-hybrid-females, compared with +(m)-hosts. If +(m)-ovaries are implanted together with the foreign ovaries into fes-or mel/sim-♀♀, the foreign ovaries develop only as far as in +(m)-hosts. Thus the better development in fes-and mel/sim-♀♀-hosts seems to be due to a greater quantity of gonadotropic hormone in these hosts rather than to a qualitiative difference of the hormone of those hosts.

The comparison of the development of the foreign ovaries in the different species might prove of value for the determination of species relationships in the genus Drosophila. According to Sturtevant there seems to be a closer relationship between the pseudoobscura-group than between the melanogaster-group and the subgenus Drosophila. The degree of development of the ovaries of the 5 species tested up to now, points into the same direction: the species may be classified in the following order:

melan.
simul.---pseudoobsc.-funebris--virilis

No difference in the gonadotropic hormones of mel. and sim. were found; pseudoobsc. seems to be nearer to funebr. than to melan.; virilis seems to be the least related to melanogaster.

Waddington, C. H. and Pilkington, R. W. Development of facet, lozenge, morula, opthalmopedia.

In a weakly-expressed facet the abnormality was due to overgrowth of secondary pigment cells which compressed the cones, causing the overlying corneal facet to bulge. In lozenge there is a failure of the cells of the middle layer of the optic disc to penetrate between those of the outer layer. The surface of the eye is thus covered with a layer of primary pigment (cornagen) cells, beneath which lie cone-cells and then completely disorderly retinular bundles. Morula eye is like that of split (Pilkington, 1941). In opthalmopedia (Gordon, DIS-14) overgrowth of eye-disc leads to folding of optic rudiment, the folded part sometimes becoming everted, sometimes remaining inverted, but never developing ommatidia.

Whittinghill, M. A position effect in brown/Moiré heterozygotes.

T(2;3)Mé carries the bw locus and the tip of 2R with the Mé complex of 3LR. Matings of various brown and Moiré stocks showed that files genotypically Moiré might appear either as the usual Moiré or as dark Moiré, almost like brown, which nevertheless tested for Mé. It was not possible, until after five months, to isolate a dark Moiré strain. Usually both dark and bright Moiré flies came from either kind of selected parents. The difference between dark and bright eyes is definitely greater than the variability found within several Moiré stocks.

Whittinghill, M. Temperature effects with supressor of forked.

Su-f modifies f^5 to a phenotype like that of f alone. The combination is temperature sensitive even to the extent of closely resembling wild type. From cultures subjected to temperatures of 9 to 36 degrees C. for one or two days it was found that the scutellar bristles were lengthened in both sexes after treatment at 9, 28, and 30 degrees, particularly if it was given at 5 to 7 days after egg-laying. At other temperatures and ages no females were affected, and a smaller fraction of the males showed lengthened bristles. This sex difference parallels the appearance of untreated f su-f flies, in which males look more completely wild type than do females. Eye shape also was altered to lozenge-like after treatment at 30 or 32 degrees.

Lees, A.D. and Waddington, C. H. Development of bristle mutants.

The bristle-forming cells are distinguishable in the epidermis at about 15 hours after pupation, by which time they are slightly larger than the other epidermal cells, and have already divided to form a pair, the trichogen which lies below and secretes the bristle and the tormogen which lies above and forms the socket. The secretion is most active between 30 and 55 hours, during which period the nuclei are very large, with polytene chromosome thread and large nucleoli.

In *scute* the bristle-cells may be absent at 19 hours; in *hairy* and an *"extra-bristle complex"* additional cell-groups were present by then. In *split* there is frequently an extra division, giving four cells which may (1) fail to reach sufface of epithelium and give no bristle or socket, (2) develop 2 bristles, 2 sockets, or 1 bristle and 3 sockets, depending on orientation. *Dicheate* may produce effect (1) of *split*, or give extra division of trichogen only, giving two bristles in single socket. In *Hairless* trichogen lies beside and at same level as tormogen, and like it gives a socket. In *Stubble*, the trichogen is shifted slightly to the side, so that tormogen does not invest the growing bristle so closely. In *shaven* the trichogen is irregularly displaced and usually partly converted to socket. *Spineless* and *morula* slow growth of bristle cells; *singed*, *forked* and *Bristle* affect nature of secretion. In combinations of mutants, threshold phenomena are important, particularly with the *H*, *Sb*, *sv* group.

Technical Notes

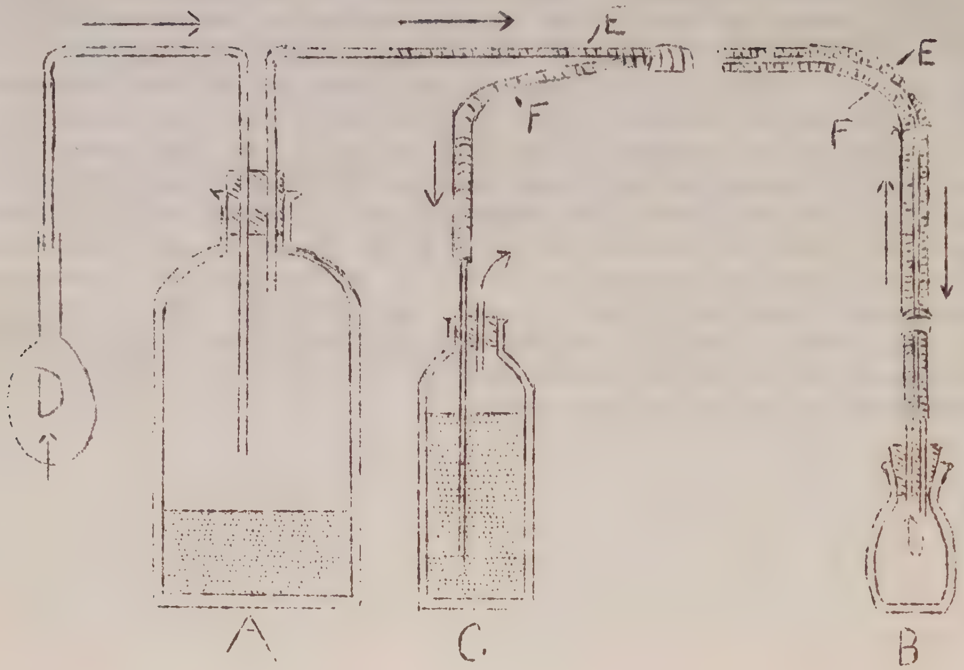
Columbia University Method for filling vials with food. The system for filling vials with thick oatmeal food, at Columbia, is as follows: Whipped-cream bags (ordered from a bakers' supply company) are fitted into copper tubes. The food, while half hot, is poured into the top of the bag and squeezed through the tubes into the vials.

The whipped-cream bags may be obtained from: R. C. Williams and Co. Inc., 265 Tenth Avenue, New York, N. Y. They may be ordered as "Dressing bags" number 5, at $.25 each or $3.00 a dozen.

The copper tubes were made by hand here in the laboratory.

Glass, H. B. Improved formula for Drosophila food. A number of different formulae were tested in order to find a food utilizing a minimum amount of agar but with greater firmness than the current oatmeal medium. The following formula proved to be superior to any medium in the author's experience, since (1) it utilizes so small a quantity of agar as to represent a real saving over the current cornmeal formula; (2) it is considerably firmer

(This drawing of a new type etherizer, by H. D. Stalker, should follow the text on 16:72).



than the current oatmeal medium; (3) it never dries out and becomes crumbly; (4) by incorporating the yeast in the mdium, it is unnecessary to open bottles from the time they are plugged or capped immediately on pouring until they are used; and (5) the food has higher productivity than the standard cornmeal medium. The amounts of the ingredients are given in the measures most conveniently used, and as proportions of a liter rather than in per cents.

Agar	6 gms.	(vary from 5 in winter to 7 in summer)
Oatmeal	1/4 cup	
Cornmeal	1/2 cup	
Brewer's yeast	10 gms.	
Water	600 cc.	

Mix cold, and boil until agar is dissolved and mixture is smooth. Add:

Syrup	120 cc.	
Moldex solution	7 cc.	(8 gms. moldex in 90 cc. of 95% alcohol)
Additional water	113 cc.	

Pour into bottles. Insert a cone of paper towelling in each. (Do not spray with yeast suspension.)

Lewis, E. B., California Institute of Technology
Cornmeal-Molasses-Rolled Oats Food.

(This formula is intended to supersede an earlier one of R. MacKnight.)
Formula for approximately 100 bottles.

Water to be put to boil	2886 cc
Water to be saved cold to moisten cornmeal	1200 cc
Cornmeal	900 g
Molasses (unsulfured)	600 cc
Rolled oats to be stirred into food just before pouring	90 g
Salt	6 g
Moldex in alcholoic solution containing 0.1 g per cc	42 cc

Materials: The cornmeal we use is of uneven grind, containing a good deal of fine and coarse. Other types of corn meal may require different handling. The rolled oats should not be of the quick-cooking sort. The type sold for chick feed should prove satisfactory.

Remarks: The crucial thing in preparing this food is to cook the cornmeal long enough so that it will jell firmly in the bottles, yet not to cook it so long that it becomes difficult to pour if not impossible. The time required will vary from one sort of cornmeal to another. Also, our cornmeal thickens more rapidly if it is boiling vigorously than if it is barely simmering. Once the cornmeal is cooked to the proper consistency it must all be poured as quickly as possible. It takes practice to judge when the cornmeal is done. It should be viscous and beginning to hold its shape momentarily.

Directions: Put the water for boiling, salt, moldex solution and molasses in a large kettle, cover, and heat until boiling. When this is boiling, and not before, stir into the cornmeal in a spearate kettle the cold water reserved for that purpose. Then add the well-wetted cornmeal (avoid lumps) to the boiling water, etc. Stir at once and continue stirring until the cornmeal no longer settles to bottom, whereupon turn off the flame and cover.

Dip some of the hot mixture, enough for 50 to 60 bottles, into a gallon teakettle with an open spout. Boil, not too vigorously, the food in the teakettle stirring frequently until the cornmeal is cooked to the proper consistency. Then stir in the dry oats, cover the teakettle, remove from the fire and pour immediately from the teakettle into the bottles, which should be arranged around the edge of a table. Arrange the bottles 10 x 10 and turn a fan on them to keep flies away. Clean the teakettle and fill with more of the hot mixture, cook and pour. Repeat the process until the original batch is used.up. Then wipe mouths of bottles free of any spilt food, add a drop of thick yeast suspension, paper and stopper.

Further remarks: If less than 60 bottles are needed, the food may be made directly in the teakettle. As many as 400 bottles may be made at a time; i.e., the total amount of food is partially cooked as above and then divided into 6 to 8 separate teakettle batches. This food should set firm in 10 to 15 minutes. If when the bottle is laid on its side the food flows percepitbly, it is underdone and will be too soft for convenient handling. If desired, dry oats may be placed in the bottom of bottles before the food is added, using 95 g evenly distributed among 100 bottles. Using the above method of thorough cooking of the cornmeal it has been found possible to dispense with this addition of oats.

For species other than D. melanogaster we stir in with the oats just before pouring 9.0 g (1 heaping tsp.) of cottonseed meal per 20 bottles. It os generally agreed that this is undesirable for *D. melanogaster*.

The above is condensed and modified from an unpublished account by Dr. R. H. MacKnight.

Stalker, Harrison D. A new type of etherizer. A new type of etherizer has been in use in our laboratory for over three years and has been found to give very satisfactory results. It consists principally of three bottles: the ether container (A), a bottle of approximately 2 liters capacity; an etherizing chamber (B), a quarter-pint culture bottle; and an ether-vapor trap (C), a bottle of approximately 500 ml. capacity partially filled with waste alcohol. Pressure on an inflating bulb (D), causes air to pass over the surface of liquid ether in A. The ether vapor is carried by the rubber tube (E) into the etherizing chamber B. The air displaced from B passes through a hole in the cork, (the hole is covered with a double piece of cheese cloth, fastened with Duco cement) and by way of tube F is carried to the ether vapor trap C, where it bubbles through the waster alcohol. It is found advisable to fasten the two pieces of glass tubing in the cork of B with Duco cement, as otherwise repeated handling may work them loose and allow the ether fumes to escape into the air. The two rubber tubes connecting A and C with B should be about two feet long, and should be fastened together with adhesive tape.

This type of etherizer allows the worker to vary at will the concentration of ether-vapor in the etherizing chamber. While one squeeze of the bulb will only partially displace the air in B, repeated pressure will gradually increase the ether-vapor concentration to any desired level. This is particularly useful when working with species differing in their susceptibility to ether. Since the etherizing chamber is cheap and easily obtainable, it can be replaced whenever it becomes contaminated with food or mites, and the cork can be wiped off with phenol.

Research Notes

Auerbach, C. The unsolved statistical problem of calculating mutation rate when eggs are treated. In order to test a possible effect of non-volatile chemicals on mutation rate it is usual to expose eggs to a fluid in which the chemical has been dissolved. Other methods that have been used are: injection of the fluid into larvae or imagines, and feeding of larvae on a medium which contains the chemical. Treatment is thus applied exclusively or mainly to immature germ cells. These subsequently develop into the much larger population of mature germ cells, out of which a random sample is used for the F_1 matings and represented by an identical number of F_2 cultures.

There is thus no longer the 1:1 correspondence between treated cells and examined F_2 cultures which obtains when treatment is applied to mature spermatozoa. In some experiments of this kind, notice is taken of this fact by grouping the F_1 according to the P_1 parent, and scoring as one any cluster of identical mutations which occurs in any of these groups. In the writer's opinion, this is misleading, since similar clusters without mutation escape notice. In the average of an adequately large sample the mutation rate should come out correctly when each mutation--whether belonging to a cluster or not--is counted as one. On the other hand, there is a real difficulty involved in the estimate of the error. Apparently in most of these experiments the standard error of the difference between treated and control series is calculated by the usual formula substituting for $n_{tr.}$ and $n_{contr.}$ the numbers of F_2 cultures in the two series. Obviously the correct values of n would be the numbers of treated control cells which gave rise to the F_2. These numbers are unknown and the writer does not see a way of estimating them from the observed data. Since the increase in mutation rate to be expected even from an effective chemical is of the order of size of a few per cent only, a valid error estimate is indispensable for evaluation of the results in all but really spectacular cases. The writer would be very grateful for suggestions how to arrive at one.

U. Fano. Remarks on the preceding note by Miss Auerbach. Two different problems seem to be involved in the issue raised by Miss Auerbach: (a) What is the standard error of the rate of mutations induced by treatment in immature germ cells? As Miss Auerbach points out, this standard error is substantially dependent on the number of treated germ cllls involved in the experiment, and not merely on the number of F_2 cultures tested. (b) What is the standard error of the rate of "spontaneous" mutations detected by standard methods in control material? It has generally been assumed that this error is given by the formula

$$\sqrt{\frac{\text{number of mutants (number of tests-number of mutants)}}{(\text{number of tests})^3}}\ .$$

Serious doubts arise regarding the validity of this formula when one considers that mutations in control material may also occur in immature germ cells. (See, for instance, the discussion of an analogous problem concerning mutations in bacteria, by Luria and Delbrück in GENETICS, 28: 491-511, November 1943.)

No theoretical solution to either of these problems is available, so far as I know. (I hope, however, to be able to report soon on some progress which I have been making toward this goal.) Miss Auerbach's main interest at present seems to be the preliminary question of how to determine whether the mutational effect of a treatment of germ cells is at all significant; and I should like to emphasize the fact that problem (a) is not involved in this question. In fact, the test of significance of the effect of a treatment is carried out by assuming first that the treatment was not effective. Thus the difference observed between the frequencies of lethal-bearing F_2 cultures from treated and from control Pl males must be compared with its standard error calculated on the basis of the "no effect" hypothesis; i.e., from the solution to problem (b). If one rejects the usual theoretical solution of this problem, and if no more accurate theoretical solution is available, it should still be possible to solve it experimentally; that is, by carrying out a series of determinations of the frequency of spontaneous lethals and scoring the departures from their means. It could then be seen, even without much help from statistical formulae, whether the results of one or more determinations of the frequency of lethals in treated material depart so much from those of the controls that they cannot be considered as belonging to the same population.

Cooper, K. W. Meiotic pairing of the sex chromosomes of male Diptera.

Inasmuch as Drosophila has in the past proved rather refractory material, a comparative cytological study is being made of meiosis in the Drosophila male and male pupiparous flies. In the hippoboscid fly Olfersia the male forms a sex chromosome bivalent identical with that of *Drosophila pseudoobscura*, showing all those "criteria" on which Darlington has based his reciprocal chiasmata hypothesis. Nevertheless in Olfersia the conjunction of the sex chromosomes is brought about not by chiasmata, but by a region of interstitial cohesion or pairing. This follows from the fact that the sex chromosomes separately condense in the nucleus prior to diakinesis and then come together to form the definitive bivalent at diakinesis. The mechanical properties of such "cohesive" segments and their role in Drosophila are being further investigated.

Harrison, B. J. An effect of culture conditions on mating.

Five females x five males from the B $ were placed in each of four bottles, $A_1 \ldots\ldots D_1$. The flies were removed from A_1 after 1 day's laying, from B_1 after 2 days, from C_1 after 3 days, and from D_1 after 4 days.

The offspring emerging on the first day from each bottle were transferred to fresh bottles, $A_2 \ldots\ldots D_2$. The second day's emergence were left in the old bottles, which were now transferred to room temperature to minimize further emergence. After 4 days, females were dissected to determine the proportion still virgin, with the following results:

Bottle	No. dissected	% virgin	Bottle	No. dissected	% virgin
A_1	8	25	A_2	11	27
B_1	17	29	B_2	14	7
C_1	18	67	C_2	16	25
D_1	21	62	D_2	11	27

Mating frequency is constant in the fresh bottles, $A_2 \ldots\ldots D_2$, but varies in the old bottles, $A_1 \ldots\ldots D_1$, being least where the bottles had been most crowded with larvae.

Kalmus, Hans. The optomotor responses of some eye mutants of Drosophila.

Drosophila flies of many species are circling inside a striped cylinder, when the latter is turned. The response can be measured by applying a series of striped patterns of different widths. Female melanogaster flies react slightly better than males. The reaction of flies carrying Bar genes is reduced, parallel with the reduction in facet number. The same applies to eyeless flies. *D. subobscura* eyeless flies with less than 12 facets do not show any optomotor reactions. Various facet abnormalities in the two mentioned species do not noticeably decrease the reaction. White mutants of *D. melanogaster* and *D. pseudoobscura* do not react optomotorically, nor do white-eyed *melanogaster* flies homozygous for brown and cinnabar. Homozygous apricot flies and homozygous brown and vermilion flies showing a similar eye color react markedly worse than wild-type flies. The eye-color mutants brown, cinnabar and vermilion in *D. melanogaster* and scarlet, maroon and vermilion in *D. subobscura* do not singly diminish optomotor reactions, but the mutant prune in the latter species abolishes it. The contour-blind flies mentioned for the most part show ordinary phototropism.

Lamy, R. Hidden divergence in laboratory strains of *D. pseudoobscura*.

In experiments involving Race A/Race B pseudoobscura hybrids, it was found that the majority of old strains of Race A carrying sex-linked markers contained genes which acted as inter-racial lethals in the backcross generation. Suitable tests showed that genes on the autosomes as well as on the X were responsible for the lethal effects. Similar effects were not observed when equally old wild-type strains were used. It is thought, therefore, that by means of inter-racial crosses a type of genetic divergence is revealed, which is not readily observable in the pure race, and which is apparently connected with the artificial selection and maintenance of major mutations as "marker genes" in stocks. It is suggested that such divergence may be due to a relaxation of natural selection in respect of whole gene-systems controlling developmental processes which are in some way interfered with as a result of the changes produced by the markers. In consequence of this relaxation, mutations of a "sub-functional" type would tend to accumulate in these genes by a process which may be described as "directional drift." The resulting deterioration in the genotype would be scarcely observable intra-racially, because although in some degree impaired or undermined, the gene systems would still hold together and retain their coordinated effects, which are more important than the effects of the genes individually. In the two races, however, the gene systems are not built up on identical patterns either in respect of linkage or of concentration of function, even though the genetic content may be largely similar. In the backcross generation, where both racial systems are mixed up, single genes may have an importance in development which they do not have in the pure race, due to lack of appropriate coordination. Hence a sub-functional mutation, which is practically harmless when the gene-system functions as a whole, may be lethal or semi-lethal if some part of that system is absent or inadequately represented, as in the unbalanced genotype of the partial hybrids of the backcross generation. Full details in press.

Muller, H. J. A stable double X chromosome.

Stock of a double X chromosome has been obtained which is superior to the ordinary attached-X chromosomes for most stock-keeping and crossing operations, by virtue of its stability in breeding, since it does not break up, by crossing over with the Y, to form viable single X's. Hence stock containing any desired X chromosome in the male and this double X in the female does not have to be watched, as ordinary attached-X stocks do, to avoid the breakdown into single X's whereby the desired single X may be lost.

The new double X, denoted by the symbol : together with symbols of any contained genes which it may be desired to represent (as explained below), arose by X-ray irradiation of early germ cells (oogonia) of a female containing one X chromosome having the formula y w dl-d9 f and one having the formula sc^8 B y^{3P} (this having the left part of a scute 8 chromosome, bearing y+ and Bar, and the right part of a yellow^{3P} chromosome, bearing the usual dark-bristled yellow allele present in the latter). Deletion of the sc^8 y^{3P}

chromosome occurred. A deleted X, doubtless derived from this breakage, having the left and right ends of this chromosome, and therefore giving the non-yellow phenotype, was in fact recovered in one of the offspring of the irradiated female. The long middle portion of the X, that was deleted out from the rest, became inserted or otherwise attached, presumably by both its broken ends, to the other X, that having the formula y w dl-49 f, and this (nearly) double X was recovered in a sister of the individual having the deleted X, in an egg laid at about the same time (some 12 days after irradiation). The doubleness of the attachment is indicated by the two dots of the colon (:) used in designating the double X thereby produced. The resulting double X, not having either the y+ of the left end or the y^{3P} of the right end of the sc^{8} y^{3P} chromosome, and having y in the part derived from the y w dl f chromosome, gives the phenotype ordinary yellow (y). The deleted piece most probably became inserted at some point into the y w f X, to form one double-length X having almost terminal attachment, since this process would require only one break of the y w f X-chromosome. Alternatively, but far less probably, the deleted piece might have become attached at (nearly) the two ends of the y w f X, if the latter had become broken within the dispensable heterochromatic region at the free left end and at the same time in that at the right end, beyond the centromere (as happened, for example, when the ring chromosomes Xc1 and Xc2 were formed). In this latter case the double X would have the form of a large (double-sized) ring. Which of these alternatives is correct is now being investigated.

Owing to the double attachment, and the presence heterozygously, of the dl-49 inversion in addition, the two X's cannot form viable recombinants with one another except by double crossing over, and this is very rare. The original double X in this case gives not only the mutant phenotype ordinary yellow but also heterozygous Bar, owing to the B of the original sc^{8} y^{3P} chromosome. By the very rare double crossing over between the members of this double X, however, Bar is occasionally lost, and then forked nearly always appears so that a yellow forked stock of this chromosome has also been obtained. The latter chromosome is represented by the abridged formula yf:= (where = represents another chromosome bearing, in effect, the same genes as those already shown; although in this case the complete structural formulae of the two X's are of course different from one another). This representation should be contrasted with that of ordinary attached X's bearing yellow forked, which are designated as y f.= in the present author's notation or, in the notation of some other authors, as y f. The yellow heterozygous Bar double-X cannot be accurately represented in so simple a fashion, but may best be shown, in our notation, as y B : y (omitting the w and f which it contains heterozygously and which do not manifest themselves).

It is planned to substitute the y f: = chromosome as rapidly as possible in place of the ordinary attached X's (y.=,y v f.=, etc., sometimes represented as y, y v f, etc.) in all our stocks that exist primarily for the maintenance of the X chromosome of the male. It is also planned to use it in place of ordinary attached X's in stocks in which special Y's are being maintained, since crossing over between the X's and the Y in the female, of such a kind as to lead to breqkdown of a special Y, should not occur as readily in this case as in the case of ordinary attached X's. Cultures of either the y f:= or the y B;y chromosome may be obtained on application.

It should be noted that flies having this double X, unlike those with ordinary attached X's, should have increased crossing over in their autosomes, because of the considerable reduction of crossing over in their X's.

Nolte, D. J. Appearance of unexpected eye colors.

Certain unexpected and as yet unidentified eye colors appeared among the F_2 of crosses with y w stock, being the sex-differentiated eye colors of cadmium orange in the ♂ and nasturtium red in the ♀. The following numbers were obtained: first, 24 ♀ and 8 ♂ among 3063 individuals of the F_2 of a cross y w x wild; second, 12 ♂ among 2062 individuals of the F_2 of a cross se x y w; and third, 126 ♀ and 74 ♂ among 12,230 individuals of the F_2 of a cross y w x se.

This strain breeds true and has been proved to be an allele of w. Out of its progeny, however, have appeared some brown-eyed individuals called "Maroon," which have yielded a true-breeding strain and which, though proving allelomorphic to w, have in the few trials completed not proved allelomorphic to its parent strain.

Phillip, Ursula. Cytologically homozygous stock of D. subobscura.

During the last year 11 wild females of D. subobscura were inbred. They yielded a number of mutants listed elsewhere. Ten females gave progeny which were heterozygous for the three pairs of autosomal inversions that are present in all our stocks. The progeny of one female, however, was homozygous with regard to chromosome order. The offspring of this fly crossed freely with all laboratory stocks against which they were tested. The female yielded two mutants, dried wing (dw) and short (st). The short stock, extracted after outcrossing to delta, was found to be homozygous. This is most remarkable, as so far all attempts to breed a cytologically homozygous stock have failed.

Philip, Ursula and Spurway, Helen. In(1)l.

Salivary-gland chromosomes show two abnormal chromosome orders B and A. Order B carries a single inversion occupying 2/9 of the chromosome, 1/3 from spindle attachment and 4/9 from the other end. B/standard (s) chromosomes pair with a normal loop. A carries a reinversion of one-third of the region inside B. Pairing takes place in the two ways described by Sturtevant, although the two chromosomes often stay unpaired.

Genetically B/S and A/S cannot be distinguished. Recombination between ct and cd (see map in this issue) markedly reduced. Actual figures: non-crossovers, 17,192; single crossovers between ct and left break of B, 142; single crossovers between right break of B and cd, 6; crossovers in both these regions, 2; double crossovers within inverted segment, 1; N.B. Coincidence of 31.

The mother of the double crossover within the inversion was S/B. The linkage map of the B chromosome, based on 1416 flies, is ct - cp 37.6; cp-sin 3.7; sin - cd 26.8. Crossing over in A/B not yet counted.

Poulson, D. F. Cytological extent of $Df(1)N^B$.

Acetic orcein smears of salivary glands of females carrying $Df(1)N^B/y\ Hw\ m^2\ g^4$, dl-49 indicate that the deficiency involves bands 3C 5 - 10. It could not be determined with certainty whether bands 4 and 11.12 are involved.

Redfield, Helen. Mosaic eyes in melanogaster intersexes.

Mosaic eyes appeared in the intersex progeny of free-X eosin triploids--a definite proportion of the light eyes (like the 2N male eosin eyes) of these intersexes, 25%, show patches of a darker color (like that of the 2N eosin females). A dark patch is apt to include about a quarter of the eye area; it may be either smaller or larger;

in extreme cases it covers an entire eye. All eosin triploid mothers of the strain, mated to eosin males, gave mosaic intersexes.

An unrelated strain of triploids with two attached-X chromosomes was crossed to males of the eosin stock. The first eosin triploids obtained did not give mosaic intersexes, but further backcrossing gave triploids whose intersex offspring had the mosaic eyes.

Free-X eosin triploids were crossed to apricot, an allele in which the color relations of the sex types are normally the reverse of those shown by eosin. As expected, the mosaicism on appearing in apricot intersexes after some generations showed light patches (female-like) on a darker background (male-like). Thus the mosaic patches always take on the color of the female eye.

The above crosses would lead one to suspect that the effect is due to something originally present in the eosin stock, not the eosin gene itself, which can manifest its presence in the presence of the sex-limited alleles of white. To test a possible relation of the presence of a Y chromosome and the appearance of the mosaicism, it was desirable to distinguish between 2X3A intersexes and 2XY3A intersexes. A stock of yellow, Hairy wing, eosin was derived and was crossed to the eosin triploids. The Hairy wing intersex offspring contain no Y (unless the triploid mother contained an extra Y), but the non-Hairy wing intersexes have received their father's Y. The classification of Hairy wing was for some reason not completely satisfactory in these intersexes, but it was definite enough to show that both Hairy wing and non-Hairy wing intersexas may be mosaics. The mosaicism, then, is not a direct Y effect unless Y chromosomes are derived from the triploid mothers. It is possible that an effect of another type is involved--somatic crossing over, for example, or autosomal chromosome elimination giving 2X2A patches.

Rendel, J. M. D. pseudoobscura A x D. subobscura.

Matings have been successfully made between pseudoobscura and subobscura in both directions. The ♀'s. always resist the ♂'s and struggle to kick them off once they are in copula. The ♂'s succeed in about 30% of cases in inseminating the ♀'s. The matings are sterile. Sperm are injected into the ♀'s and eggs are laid, but none hatch. Eggs have not yet been sectioned to determine whether they are fertilized. The sperm plug formed by the pseudoobscura ♂ ejaculate in the subobscura ♀ is much more substantial than that of the subobscura ♂, and sometimes causes eggs to be caught up and prevents laying. This is not always the case, and given time, the subobscura ♀'s inseminated by pseudoobscura ♂'s do lay. The sperm bundle of pseudoobscura, when injected into subobscura ♀'s, is sometimes slow to break down, and remains a sticky, coherent bundle in the sperm receptacle.

Schultz, Jack. A derivative of In(1)w^{m4} showing a different reaction to heterochromatin.

In (1)w^{m4} was found by Muller to give derivatives showing a change in the degree of mottling. A number of new ones have been found, and in the case to be described tests have been made (1) of the locus of the difference between the original and the derived chromosome and (2) of the reaction of the derivative to modifiers of variegation. In contrast to w^{m4}, which has a ground color in the ♂ resembling the white allele coral, the derivative has an almost white eye, This difference, by appropriate tests with crossovers between w^{m4} and other not quite identical inversions, turns out to be located at the junction between the white locus and the heterochromatin of the X. Salivary-gland analysis shows no gross difference in the rearrangement. It might be suspected that a mutant at the white locus, tp some slighter allele, is involved. By the addition of extra Y chromosomes, and experiments also with suppressors of the variegation effect, it was shown that the wild phenotype can be attained by the derivative as well as by the original w^{m4}. The difference is that two additional Y's are required to give the effect in the derivative that is reached with one in the original type. Conversely, experiments with enhancers of variegation show that the derivative gives a more extreme reaction. Thus the change concerns the reaction of the white locus to the heterochromatin balance of the nucleus.

Slizynska, H, and Slizynski, B. M. The distribution of sex-linked lethals.

As a preliminary step in the study of the nature and type of the chemically induced sex-linked lethals, the position of 89 out of more than a hundred obtained by Dr. C. Auerbach was determined genetically. The distribution of these lethals in the genetical map is as follows: (0-5) : 17; (5-10) : 2; (10-15) : 6; (15-20) : 4; (20-25) : 9; (25-30) : 5; (30-35) : 8; (35-40) : 4; (40-45) : 3; (45-50: : 3; (50-55) : 5; (55-60) : 4; (60-65) : 9; (65-70) : 4; The lowest frequency was found between 5 and 10 due to sudden drops around locus 10. Five lethals out of 10 so far as investigated were found to be deficiencies.

Steinberg, Arthur G. Is a chromosomal aberration necessary for a position effect?

Existing evidence has shown that in general a position effect is obtained (a) when certain mutants which are normally situated close to heterochromatin are translocated, by means of a chromosomal aberration, to a region far removed from heterochromatin (e.g., ci), and (b) when certain mutants which are normally situated in a region far removed from heterochromatin are translocated to a heterochromatic region (e.g., w). It has been shown that the presence of an extra Y chromosome enhances the position effect of the former group of mutants and inhibits or suppresses the position effect of the latter group of mutants. This contradictory action of the Y chromosome may be only apparent. If we reason that the important factor in the position-effect phenomenon is the percentage of the total heterochromatin contained in the cell which lies adjacent to the affected locus, and not the absolute amount of heterochromatin near the affected locus, it follows (a) that a position effect of ci arises when the relative amount of heterochromatin adjacent to it is reduced and (b) that a position effect of w arises when the relative amount of heterochromatin adjacent to it is increased. Since an additional Y chromosome increases the total heterochromatin content of the cell without affecting the absolute quantity of heterochromatin adjacent to the locus under observation, it follows that the relative amount of heterochromatin adjacent to the locus is reduced; hence the position effect of ci is enhanced and that of w suppressed. Finally, this reasoning leads to the conclusion that it should be possible to obtain a position effect of ci in the absence of a chromosomal aberration, by increasing the total quantity of heterochromatin in the cell so as to reduce the amount of heterochromatin adjacent to the ci locus. At the time of writing, ♀♀ containing three Y chromosomes and heterozygous for ci have been obtained. They show no position effect for ci. Experiments designed to obtain ♀♀ containing four and possibly five Y chromosomes are in progress.

Technical Notes

Auerbach, C. Treatment of dechorionated eggs.

When dechorionated eggs are exposed to solutions, the main difficulty experienced is the tendency of the eggs to float on the surface. In order to obtain complete immersion, the writer used the following method. Batches of from 20 to 30 eggs are dechorionated in the usual way on a slide. A small piece of filter paper is soaked with the required fluid and stuck into the bottom of a block dish or watchglass. The eggs are transferred as a cluster into the center of the paper. With fine needles the paper immediately surrounding the cluster is roughened up and the loosened fibers bent over the eggs so that a kind of closed pocket is formed in the center of the paper. Only then the fluid is poured into the dish. For washing eggs, the piece of paper can easily be transferred with a forceps into other dishes without disturbing the enclosed eggs. For removing the eggs, the paper is lifted out of the fluid and put on several layers of filter paper. The pocket is then opened, and the eggs can be transferred to food.

Gowen, J. W. Mold

A green mold, of unusually vigorous and resistant strain, has been bothering us lately. To overcome it, we have tried Moldex and more recent product, Spergon, in the concentrations indicated below. The Moldex was not too successful. Seven rather difficult stocks were chosen, two pairs from each. Egg productions are for 7-day periods.

Mold preventive	Amount added to medium	Pairs counted	Total eggs	% cultures moldy
Spergon	1/1500	14	1284	0
	1/3000	14	1598	14
	1/6000	14	1484	36
	2/12000	14	1772	64
Moldex	1/250	14	760	21
	1/333	14	1140	50
	1/500	14	974	71

The mold preventive was added to the medium just before it was poured. The bottles were seeded with Fleischmann's Yeast in tap water and paper toweling added. The toweling was soaked in the same concentration as that added to medium, then dried before use.

We interpret the results as follows. Moldex reduces the flies more than Spergon in concentrations used. For this mold, 1/1500-1/3000 of Spergon is about the right concentration. Spergon has another effect, however. It encourages acid fermentation so that cultures become quite acid. This acid may sometimes liquify some of the agar and leave the culture very wet. To discourage the organism which causes this fermentation, we are now adding 0.1% Moldex as well as 1/5000 Spergon.

Schultz, Jack. An improvement in technique for the agarless cornmeal-molasses-rolled oats medium.

The difficulties encountered in the pouring of the agarless cornmeal medium depend upon ascertaining the correct stage at which to stop cooking. There is unfortunately a very slight differential between the stage at which a degree of consistency is reached sufficient for a proper culture medium, and one at which the food is too thick to be poured easily. A procedure which obviates this difficulty follows:

(1) Ingredients in the proportions suggested by Lewis (DIS-16: 71) are mixed. Some experimentation, dependent on the type of cornmeal, will be necessary, since in the present technique, which permits more thorough cooking, less cornmeal may be used. Salt is not necessary.

(2) Cooking proceeds until the cornmeal no longer settles to the bottom.

(3) Medium is poured into the unsterilized bottles. At this stage the medium is quite fluid, and can be poured easily, by any of the techniques used for the previous agar-containing media.

(4) The bottles with the medium in them are now sterilized (either in a large autoclave or, where such is not available, in a large garbage can). This provides the additional cooking necessary to make the medium sufficiently stiff for Drosophila culture. Care is necessary to prevent the accumulation of water of condensation inside the bottles; either paper milk-bottle tops can be used, or a mass cover for each layer of bottles—a simple procedure in either case.

(5) Yeasting and papering are carried out as desired after cooling. If the bottles have been covered individually, these final steps can be left until the appropriate time before use, an advantage when food is not prepared daily.

Spassky, B. Cream of wheat-molasses fly medium. Due to the shortage of agar, several non-agar mediums have been tried out in Professor Dobzhansky's laboratory. For the last year, cream of wheat-molasses medium, introduced by the writer, has been used widely. It was found to be satisfactory with D. pseudoobscura, D. persimilis, D. melanogaster, D. miranda, D. azteca, and others.

Formula for 100 half-pint bottles is as follows:

Water	4500 cc.
Cream of wheat	625 gr.
Molasses	670 cc.
Salt	7 gr.
Moldex	40 cc. (10% solution in 90% alcohol)

Regular cream of wheat of "The Cream of Wheat Corp., Manf., Minneapolis, Minn." is used. The other kinds, as well as the "5-minute" variety of the same manufacturers, have not been tried. Molasses of the same specification as for agar food is used.

The procedure is the same as for agar food, but agar is omitted and cream of wheat is used instead of cornmeal. About 3/4 of the indicated amount of water is put on the fire, while the balance of the water is left aside cold. Salt, Moldex and molasses are added to the water on the fire. When the mixture is boiling, the needed amount of cream of wheat is put into the cold water that was left aside, stirred and dumped into the boiling mixture at once. From this point on the food has to be stirred constantly to prevent burning. After the whole mixture starts boiling again, it has to be boiled for 3-7 minutes, depending on the intensity of the fire and the quantity of food.

Food is poured into the bottles through the tin funnel with its nasal cut off. A fast worker can pour as many as 200 bottles. For a larger number, the food is poured as long as it is thin enough for pouring, and then the balance of it is packed into a pastry bag and pushed into bottles. The idea of using a pastry bag was introduced by one of the men who prepared the fly food at

Columbia University (see DIS-16). Vials too are filled with a pastry bag, although for a small number of vials the food can be poured.

A larger quantity of food per bottle or vial is used. The ratio between the quantity of agar and of cream of wheat food per bottle is 1 to 1 1/2($1:1\frac{1}{2}$). One-third of the vial is filled with food; only a slight slant is made. A thin strip of paper folded twice is pushed through the food to the bottom of each vial to allow gases to escape. A drop of fresh yeast suspension is put in each bottle or vial, as usual. Dry brewers' yeast was tried and is not recommended for this kind of food. The addition of dry yeast causes too strong immediate fermentation, which is harmful to flies and makes the food watery.

This food is a jello-like substance. It does not come off at the "shaking-out" operation, which allows systematic counting of flies and collecting of virgins. The other non-agar food tried did not have this desirable property.

The favorable condition of the food cake persists indefinitely, provided the temperature and humidity are normal. In our particular case when the temperature in the cold room is 15-17 degrees C. and the humidity is abnormally high this food gets watery in about 35 days (the other non-agar food in less than 2 weeks under the same conditions). By using a 1-month rotation for stocks, transferring them in a month's time, we were able to overcome this difficulty.

Research Notes

Goldschmidt, R. Correction of statements in Bridges-Brehme, The Mutants of Drosophila Melanogaster. (1) Bkd: Blackoid (page 25) to be changed to bB = Df(2L)35CD. (2) The translocation called poi (page 150) is actually a silver allele called svr^{poi} combined with the pseudo-translocation 1-2, the latter having no effect and not being necessarily combined with the silver allele.

Hsu, T. C. On the racial differentiation of Drosophila montium. That the so-called two races of D. montium differ in the number of teeth of the sex-combs, as formerly reported by Kikkawa, was subjected to more crucial analysis by studying the character in those individuals isolated from the hybrids. The flies so segregated from the hybrids did not show any significant difference in the number of teeth with respect to the corresponding chromosome types. Moreover, experiments were also attempted to test preferential sexual selection between the two races. The results obtained were also negative. This is in agreement with the fact that some individuals collected from the wild were definitely hybrids as demonstrated by the metaphase chromosome plates. In view of the negative sexual isolation and the absence of any distinct morphological or physiological dissimilarities between them, the so-called two races of D. montium can hardly attain the rank of two separate races and may as well be considered as only two different chromosome-type strains, as has been suggested by Dr. C. C. Tan.

Lamy, R. Chromosome 2 in D. pseudoobscura and D. persimilis. Crossing over in pseudoobscura/persimilis hybrid females is 34.5 between Stubble and Pale, zero between Pa and Eyeless-2, and 7.9 between Ey-2 and arr. In pure pseudoobscura the corresponding figures are 33, 24 and 28 respectively. In the hybrids, 3% of double crossing over between Sb and arr was recorded on 544 flies. After the hybrids had been backcrossed for several generations, crossing over in the Sb-Pa region was reduced to about 21(267). These figures supply an approximate genetic boundary to the "racial inversion" in 2, which may be taken to extend from a short distance to the left of Pa to a point much nearer to arr than to Ey-2, and so probably including the cinnabar locus. This would explain why other workers have found it impossible to transfer cn from one species to the other, since the whole inverted region would have to be transferred with it. (Dobzhansky 1936).

By repeated backcrossing the persimilis inversion has been transferred into the pseudoobscura genotype. The stock carries the composite 2 in heterozygous condition, the persimilis region being unmarked and the pseudoobscura 2 containing the homozygous lethal Minute (62), which acts as a balancer. Both males and females homozygous for the composite 2 are perfectly viable, but only the females are fertile.

In the reciprocal arrangement, rather more than the inverted region of pseudoobscura has been transferred into the persimilis genotype, only some portion to the left of the Pa locus being of persimilis origin. Moreover, the chromosome carries the pseudoobscura markers, Pa Ey-2 arr. Heterozygous males and females are fertile. Homozygotes are viable but weakened by the markers. The females may be fertile.

Females of either of these stocks are easily crossed to pure males of the other species, and give the two expected types of hybrid sons: full hybrids with large or medium-size testes (according to the cross), and partial hybrids homozygous for the inversion in 2 peculiar to one species and containing the X of the other species. The latter have very small testes. Males heterozygous for either composite chromosome are extremely difficult to cross with females of the opposite pure species, The reason is obscure. Some offspring have been obtained, however. Males receiving the composite 2 from their fathers are of course homozygous for the racial inversion, which corresponds in origin with their X. Where the mother is of persimilis type, such males have considerably larger testes than their full hybrid brothers. When the mother is of pseudoobscura type the testes of full hybrids are expected to be normal in size; in some crosses however, the partial hybrids (homozygous for the 2 inversion of pseudoobscura) have been observed to have larger testes even than their full hybrid brothers. This point needs confirmation.

The left portion of 2, containing the gene Stubble and probably 20-25 chromosome units, has also been successfully transferred from pseudoobscura to persimilis. Homozygous males and females are both fertile in spite of the strong handicap of Sb/Sb. This supports the idea that the more important points of divergence between the species exist within the regions where the gene sequence has been altered, as would be expected. Hybrid males homozygous for the inverted regions of both 2 and 3 would possibly be fertile. An attempt is being made to mark off genetically and transfer the inversion in 3.

Nolte, D. J. White of y w an interaction-product.

The unexpected appearance of certain eye colors in our y w stock, appearing in crosses with this stock and reported in DIS-17, has now been proved to be due to the interaction of two sex-linked factors which have been called: (1) o - orange -- the males have the eye color of cadmium orange and the sex-differentiated females a reddish orange to nasturtium red; (2) dr - dark red -- males and females have the eye color a brickdust or chrysanthemum on pupating, darkening to a maroon or garnet resembling ras^2.

In both cases the ocelli are pale and the malpighians colorless; homozygous o dr has white eyes with colorless ocelli and malpighians. Both o and dr thus appear to be dominant alleles of w. It appears likely, however, that this y w stock, which was obtained from Germany several years ago, never contained w or does not now contain it, although the data obtained in the different crosses made do not eliminate the possibility that w may be present in addition to o and dr.

The laboratory has no w stock to compare with the interaction-product, and the deficiency of stocks has limited the determination of the c.o.v. of the two factors to that with the y of the original "y w" stock; this shows the location of o at ± .5 and of dr at ± 4.3. No aberrations have been found in salivary-gland chromosomes.

Pontecorvo, G. Synchronous mitoses and differentiation, sheltering the germ track.

It is rather puzzling that it takes 15 days or more, after irradiation, to begin to obtain a drop in the % of Drosophila spermatozoa carrying recessive (Muller, 1928) and dominant lethals (Kaufmann and Demerec, 1942). Even allowing for arrest of mitosis, spermatozoa mature 10 or more days after irradiation must have been in premeiotic stages at the time of irradiation. In most insects the cells derived from a single primary spermatogonium divide synchronously a number of times, fixed in each species; in D. melanogaster, 4 times. The 16 spermatogonia undergo meiosis and spermateleosis, again synchronously, and form bundles of coeval spermatozoa (64). Owing to the unsuitability of Drosophila for detailed histological investigation, I have used Pediculus corporis, which has the advantage of having meiosis pushed back in the germ track followed by six "spermatogonial" divisions, during which, of course, the germ cells are haploid and hence supposedly exposed to drastic germinal selection. The results are, very surprisingly, that whilst irradiation (4000 r.) kills a high proportion of pre-meiotic germ cells, and many in early meiosis, and stops for five days entrance of new germ cells into meiosis, it has no immediate harmful effect on all stages ranging from late meiosis to mature spermatozoa, a span including six mitoses and spermateleosis. It should be noted that all usual chromosome rearrangements are produced and can be seen (testing of spermatozoa for dominant lethals confirms it); but the cells carrying these rearrangements, many of which are "lethals", go through six mitoses and spermateleosis undisturbed. Apart from the direct observation of no cells individually killed, counting of spermatozoa in each bundle (easily done in cross sections) confirms that no germinal selection takes place in all these stages. The only exception is that occasionally a whole cyst is killed; but this is almost certainly a secondary effect of some injury to non-germinal tissue.

What histological observation is possible in Drosophila confirms that the same situation, mutatis mutandis, holds here too. Irradiated testes show necrosis of the small number of apical cells (homologous with the pre-meiotic stages in the louse) and no necrosis of cells in the spermatogonial divisions, meiosis and spermateleosis, again with the exception of occasional cysts degenerating as a whole.

What characterizes in Pediculus the span from late meiosis to mature spermatozoa, and in Drosophila the span from spermatogonia to mature spermatozoa, is the fact that all cell activities (division and differentiation, etc.) take place with perfect synchronization between cells of a cyst. The cyst functions as a syncytium and the nuclei of different cells cooperate. A harmful mutation (in the broad sense) produced in one chromosome at the beginning of the synchronized span will be, at most, in the same condition as a harmful mutation one-fourth heterozygous in a tetraploid.

The facts reported here confirm and extend the finding by Barber (1940) of the sheltering effect of synchronized pollen grain mitosis in certain Orchidaceae. The conclusion as regards Drosophila is that the part of the germ track in which no germinal selection takes place extends from the beginning of the spermatogonial divisions to mature spermatozoa. The evolutionary implications of the sheltering of the germ track are interesting, but cannot be gone into here. The results summarized here were reported at the December 1943 meeting of the Genetical Society in London. -- July, 1944.

Sheng, T. C. A case of high frequency of nature-occuring phenocopies of Drosophila.

In a restricted locality in the vicinity of Meitan, Kweichow, China, about 1400 D. melanogaster flies were caught within a period of three weeks in the Fall of 1941. Among them 184 individuals showed various kinds of simulating mutants affecting such bodily parts as bristles, wing, eye, and others. The individual abnormal fly was allowed to inbreed for two or three generations, and in no case was it found to breed true, though abnormal ones of one kind or another might be obtained. There were, however, 20 males showing yellow-colored body, which was found to be inherited as a sex-linked recessive, presumably homologous to the well-known yellow-body gene of the species.

As regards these simulating mutants, which may be referred to also as phenocopies, some of them bore close resemblance to the expression of some of the known authentic mutants. What causes the occurrence of such a high frequency of phenocopies in nature is as yet unclear. The plausible explanation may be that its inherent special genetic constitution renders this strain of D. melanogaster more susceptible to environmental changes.

Stern, Curt. Irradiation of hairy males of D. melanogaster.

Among translocations involving chromosomes 3 and 4 of D. melanogaster four new cases (in addition to the one described by Dubinin and Sidorov) were found in which the normal allele of hairy (h,3,26.5) in combination with the recessive allele showed a position effect. Since it has been shown that a changed position of recessive allele cubitus interruptus frequently results in a dominant expression of this allele, a corresponding experiment was planned for hairy. Males homozygous for this recessive allele were X-radiated at 5000 to 6000 r, mated to normal females and the scutellum of the F_1 inspected for cases of dominance of hairy. No such cases were found among 17,922 flies. Two individuals which showed small patches of hairy on the scutellum, but nowhere else, did not transmit to their offspring the ability to show hairy. The origin of the two patches were probably due to somatic crossing over and unrelated to the radiation of the P- males.

Sturtevant, A.H. Crossing over in 4.

Following a suggestion of Dr. J. Schultz, crossing over has been tested in chromosome 4 in 3n females. Preliminary tests (from triplo-4 females) indicate that such crossing over is very frequent; the technique may be useful to those working with 4. A gvl sv^n chromosome was easily obtained, and is now available.

Muller, H.J. (1) Failure of desemination by nitrogen.

An easy, effective means of what may be called the "desemination" of females would be a very important advance in Drosophila breeding technique. Following the report, personally communicated by some Drosophila workers, that females placed for half an hour in nitrogen atmosphere retain their fertility but have the spermatozoa in their genital tracts killed, an extensive trial was made of this method. Treatments up to several hours in length were given to numerous inseminated females as well as, separately, to males, by keeping the flies in bottles through which humidified nitrogen was circulated. The flies were not killed, but neither were the spermatozoa. There was no indication that the females laid fewer fertilized eggs, or that the males had lowered fertilizing capacity.

Earlier experiments by the author (1927) had given some indication, however, that mature sperm are killed more easily by "heat shock" -- i.e. by a temperature of 37°-40°-- than are earlier stages of spermatogenesis, or any stages of oögenesis; and it may be that a satisfactory heat dose could be discovered for this purpose, for most stocks. Stocks vary considerably, however, in the resistance of their early germ cells to sterilization by heat, so that it might be advisable to test out any given stocks in this respect, before large-scale application.

Muller, H. J. (2) High primary non-disjunction of the insertional double-X.

The double-X chromosome denoted yf:-, produced by insertion of the central euchromatic region of a scute-8 X into another X (containing dl-49 but no long inversion), described in DIS-17, has been found usually to give between 1 and 2% of non-disjunction with a sc. $Y^{\underline{1}}$ chromosome in females having these chromosomes. Presumably it would give a similar amount of non-disjunction with a normal Y, since this sc. $Y^{\underline{1}}$ chromosome has been found otherwise to disjoin normally. The non-disjunction is evidently caused by the presence of the heterochromatin of the scute-8 chromosome at points distant from the heterochromatin and centromere of the recipient X chromosome, thus tending to divert the pairing of the latter chromosome region and of the Y from each other. It is noteworthy that in scute-8 males, on the other hand, there is very little primary non-disjunction of the X and Y, despite the displacement of a considerable part of the heterochromatic region of the X to the distal end. These effects are being studied further, with special reference to the blocks.

Muller, H.J. (3) Reddish-- a new near-normal allele of white.

This new allele of white does not appear to differ from the normal "red," at least in bar-eyed males. (It has not yet been obtained in non-bar flies, or in homozygous females, although crosses for this purpose are under way.) In compounds with apricot the female (heterozygous bar) shows a maroon-colored eye considerably darker than homozygous coral or wine. The mutation arose spontaneously from apricot in a scute-8 Bar Inversion-S apricot chromosome of a female whose other X was non-inverted and also contained apricot.

Muller, H.J. (4) Tandem attached X's producing ring chromosomes.

A stock of attached X chromosomes has been obtained in which one of the X's is of normal structure while the other contains the scute-8 inversion and the smaller, included, Inversion-S. The centromere is attached between the eucentric regions of the two X's, near what is ordinarily the "proximal" end of each. Thus the 2 X's are not arranged in th usual mirror-image fashion but (to use Bridge's expression for repeats of this kind) "in tandem." Mutant genes present are yellow-2, in the non-invered X, and Bar and apricot in the scute-8 X. As can readily be seen on making a diagram, single crossing over between a non-inverted X chromatid and that scute-8 chromatid with which it is joined (not the sister scute-8 chromatid) gives rise, on account of the tandem arrangement with included centromere, to a monocentric ring X chromosome which is not double but single, and which is deficient for the left-hand tip of the X chromosome up to and including achaete. (This result follows only if this crossing over is outside of Inversion-S.) In our present stock, males with the deficient ring are viable, though not fertile, because the free Y chromosome present is sc. $Y^{\underline{1}}$, which contains the missing part of X.

Similar deficient rings (Xc3) were obtained at the Institute of Experimental Biology in Moscow in 1936 (by Sokolov, if my recollection is correct), by means of the previous X-ray synthesis of attached X's of the above kind for that purpose. In the present case, the attached X's arose spontaneously, by exchange between the proximal heterochromatic regions of a scute-8 chromosome and an X chromosome which had a short arm of the Y attached to it. It seems likely that this exchange involved crossing over between the Y^s and the homologous region of scute-8 lying just to the left of the centromere, so that the centromere of the attached X's was derived from that of the $X.Y^s$ chromosome.

This exchange took place either in the original zygote nucleus of the fertilized egg from which the variant individual was derived, or in a nucleus of a cleavage stage so early that all the nuclei of both gonads were derived from it, since all daughters of the variant individual received a derivative of the attached X chromosomes. As the scute-8 X was of maternal origin and the X.Y^S paternal, this exchange must have taken place at a stage at which it has often been thought that the chromosomes of flies still maintain "heterogony,"--i.e., fail to undergo a mixture of maternal and paternal groups. This evidence that the two groups can be intimately intermingled even at this stage supplements that of Sidky's, in which there was a translocation between an irradiated paternal and an unirradiated maternal chromosome.

The present stock is useful in giving a constant supply of rings (Xc4); these are produced in a fairly high proportion (4 to 5%) of the progeny.

Muller, H.J. (5) Use of males with defective Y's to promote the laying of unfertilized eggs. In some experiments it is desired to have females which are in effect virgin lay their eggs in abundance from the beginning of their potential egg-laying period (i.e., after the first day of imaginal life), instead of retaining most of them for the first week after hatching as actual virgins usually do. Tests with males having deficient Y chromosomes show that the young females after copulation with these males lay eggs in abundance like properly inseminated females, although these eggs are, as is known, unfertilized. Although some immotile sperm may be passed in these copulations it seems probable that it is some nervous reaction attendant upon the act of mating of the female which here leads to ovulation (and oviposition), as occurs in the rabbit when vasectomized males are used. This conclusion can be check by similar tests with Drosophila males known to have normal copulatory behavior but to produce no sperm (e.g. homozygous simulans-IV melanogaster males).

Technical Notes

Spencer, W.P. A device for pouring food into creamers or vials. With the scarcity of agar, various media are in use which are not easily poured into vials or creamers. The device described below obviates this difficulty. A rectangular base metal support is fastened rigidly near one end of a board about 24 inches by 8 inches. Cleats are nailed to the underside of this board at the two ends, raising it off the table sufficiently so that a large Petri dish may be slipped under it. An extension clamp is fastened by a clamp holder to the metal support. In the extension clamp is placed a plastic funnel, one-pint size or larger. A hole slightly smaller than the creamer or culture vial is bored through the board and the funnel set directly above this hole. A wooden dowl pin is beveled down so that it fits into the stem of the funnel. Two small strips of wood, forming a V-shaped guide, are tacked to the board on either side of the hole. With the stick, or dowl pin, which should be about 8 inches long, in place in the funnel stem, the hot medium is poured into the funnel until it is full. Then a vial or creamer is placed under the funnel stem, using the V-shaped guide for placing it quickly and accurately. The stick is then raised and pushed back into the funnel stem, delivering the desired amount of medium. With one hand the operator raises and lowers the stick and with the other handles the vials or creamers. Any drip from the funnel stem drops through the hole into the Petri dish placed beneath the board. Even when medium becomes too stiff to pour, it can readily be pushed through the funnel stem with the stick. With a little practice it is possible to pour 100 creamers in five minutes with this device. The only parts to be cleaned are the plastic funnel and the stick.

Research Notes

Cooper, K.W. Detachment of XX chromosomes.

Since heterozygous autosomal inversions may increase the rate of crossing over in X chromosomes, an attempt was made to discover whether they increase the rate of breakage of XX chromosomes through crossing over with the Y. y^2 w^a cv v f females and Canton-S males were used throughout, and the results are as follows: XX/Y; Cy L^4/+; Cx, D/+: 4 of 53 cultures gave detachments; XX/Y; Cy L^4/+; +/+: 2 of 49 cultures gave detachments; XX/Y; +/+; Cx, D/+: 2 of 45 cultures gave detachments; XX/Y; +/+; +/+: 5 of 46 cultures gave detachments. Apparently there is no pronounced effect of these heterozygous autosomal inversions on detachment of XX. In all, there were 14 detachments (9 ♀♀; 5 ♂♂) in a total of 18,654 flies, giving a frequency of detachment of about 1 in 1300, which is the same as that reported by E.G. Anderson (Genetics 10: 415) for a series of 9,146 offspring. Two triploid females and one intersex also occurred in the experiments with inversions.

Falbo, Homero O.B. and Rubens, R. Ré A new sex-linked lethal affected by temperature.

The lethal effect is clearly expressed in cultures kept at 23 degrees C. or below. At temperatures above 26.5 degrees C., the lethal effect disappears.

I. Cultures at 23 degrees C. Cross:(w^e + m/+ l +) ♀ x (w^e + m) ♂. ♀, 435. ♂: ++, 0; +m, 9; w^e+, 48; w^em, 118; total, 175. Cross: (w^e + cx/ + l +) ♀ x (w^e + cx) ♂. ♀, 6,376. ♂: ++, 7; + cx, 149; w^e+, 126; w^ecx, 2,788; total, 3,070.

II. Cultures at 26.5 degrees C. Cross: (w^e + cx/+ l +) ♀ x (w^e cx) ♂. ♀, 413. ♂: ++, 119; + cx, 10; we+, 16; w^ecx, 194; total 339.

III. Males raised at 26.5 degrees C. and crossed by (w^e cx/w^e cx) ♀ transmitted the lethal at 23 degrees C. or below. (1) Cultures at 26.5 degrees C. Cross: (w^e + cx/w^e + cx)♀ x (+ l +)♂. F_1: ♀-++, 14; ♂-w^e cx, 12. F_2: ♀-++, 66; + cx, 5; wo+, 1; w^e cx, 37; total, 109. ♂-++, 15; + cx, 3; w^e+, 0; w^e cx, 50; total, 68. (2) Cultures at 23 degrees C. Females (w^e + cx/ + l +) from F_2 x (w^e cx) ♂. ♀: ++, 45; + cx, 5; w^e +, 3; w^e cx, 42; total, 95. ♂: ++, 0; + cx, 1; w^e+, 0; w^e cx, 46; total, 47.

This new sex-linked lethal is located approximately at locus 8.

Gloor, H. Phenocopy of a lethal mutant (crc).

The new lethal crc (2-55±1) suppresses head eversion. The head develops and remains within the thorax. But in few cases it is partially everted. In addition to this most striking fact there are other abnormalities: bristles, wings, and legs are shortened, whereas the abdomen is much longer than normally. Imaginal development is completed in most organs, but the flies are not able to hatch. In an analysis of the developmental processes which possibly could give rise to the manifold effects in the crc mutant, an attempt was made to reproduce the same abnormalities in an experimental way. By exposing normal prepupae from a wild stock of Drosophila melanogaster for a short time to a temperature of 40° C., we obtained, in a considerable percentage, lethal imagoes of exactly the same type as the crc monsters. Heat treatment is not only followed by more or less complete lack of head eversion, but also the minor characteristics of the mutant type are induced. Thus we have produced a real phenocopy of a lethal mutant character. Experiments apparently leading to the same developmental disturbances may also be performed by refrigerating or by etherizing normal prepupae.

Kalmus, H. The cure of carbon-dioxide-susceptible flies by low temperature.

Late larvae and pupae of a Drosophila stock showing L'Heritier and Teissier's carbon-dioxide susceptibility can be made to produce resistant flies, if they are exposed for several days to temperatures below 16 degrees C. or to sublethal concentrations of carbon dioxide. Some of these cures proved to be permanent; i.e., not only the flies that emerged from the treated pupae or larvae were resistant, but also their offspring. In other experiments a recovery of the strain could be observed.

Kalmus, H. and A. N. Mitchison Transplantation of ovaries from and to larvae susceptible to carbon-dioxide.

By the technique of Ephrussi and Beadle, ovaries from a stock bearing genes for ebony and showing the susceptibility for carbon-dioxide described by L'Heritier and Teissier were transplanted into wild-type larvae of female resistant type. A small percentage of those Anlagen joined up with the rest of the genital tract during pupation and became functional. By mating such females to males homozygous for ebony, but not showing the carbon-dioxide susceptibility, two kinds of offspring were produced; phenotypically wild-type flies from the ovary of the host, and phenotypically ebony flies from the implanted ovary. The former were never susceptible to carbon-dioxide, the latter always.

Offspring from flies developed from susceptible ebony larvae carrying an implanted wild-type ovary mated to resistant males homozygous for ebony, were also of 2 phenotypes: ebony, which were partly susceptible and partly resistant, and wild-type, which were all resistant. The causes of the partial loss of susceptibility are not yet understood. The main result of the experiments seems to be that the susceptibility to carbon-dioxide cannot be induced in resistant tissue even under the favorable conditions of histolysis during pupation. Therefore the material basis underlying the susceptibility is perhaps better described as a plasmagene, rather than as a virus.

Kaufmann, B.P. Spontaneous mutation rates.

Ten years ago N.W. Timofeeff-Ressovsky presented data showing that the percentage of mutations occurring in the chromosomes of Drosophila varies with the age of the spermatozoon. Similar experiments carried out during the past year have given parallel results. Lethals arising spontaneously in the X chromosome at 22 degrees C. were about one-half as frequent in 16-day-old sperm, and one-fourth as frequent in 32-day-old sperm as in sperm transferred by males 1 day after emergence. Differences between the 1-day and 32-day material were statistically significant.

Lamy, R.

A case of unexpectedly high occurrence of gonadic mosaicism has been observed incidentally in a recent experiment designed primarily to measure the spontaneous mutation rate. The ♀♀ used were scar/sc^{S1}(InS)w^a sc^8. Three out of the 1700 (whose progeny were inspected through the glass in the ordinary way for the presence of sex-lined lethals) carried out on about 1/8 of their X chromosomes; in two cases the sc^{S1}(InS) w^a sc^8 chromosome of paternal origin was affected, and the maternal scar chromosme in the other case. Another ♀ who showed a marked deficiency of w^a sons and whose progeny were in consequence tested individually, was proved to have been mosaic for a lethal on the w^a chromosome (derived from the father).

Philip, U. and Spurway, H. Equational primary exception in *D. subobscura.* A female homozygous for cv^2 was discovered in the F_2 from ctcp +/ctcp + female x ++ cv^2 male. She produced XYY sons.

University of British Columbia Report on Research Monochromatic ultraviolet radiation of Urbana-S Drosophila at different stages of the life-history produced numerous wing abnormalities in 4 to 6-day larvae. The results so far appear to verify Epstein's experiments on wing sensitive areas.

Technical Notes

Altenburg, Edgar A. Method of mite control. Consists of rearing flies from shelled eggs. This completely rids a stock of mites in one generation, but of course it does not prevent reinfestations of the stock.

Mainland, G.B. (1) The use of the Waring Blender in food making. In the preparation of various food media, bananas or dried yeast is commonly used. Both bananas and dried yeast are normally difficult to process so as to give uniform, finely dispersed suspensions in the media. The Waring Blender (obtainable from Cenco) obviates these difficulties. Ripe, peeled bananas may be placed in the blender without the addition of water, and within several minutes one has a smooth paste which may then be added to the other ingredients; the paste should be used immediately however, as it tends to gel upon standing. In the case of dried yeast, it seems best to use about 200 cc. of water to each 100 gr. of yeast for an easily poured mixture. Place about 2/3 of water in the blender, start the blender, and then slowly add the dried yeast. When the dried yeast begins to collect on top, add a part of remaining water. If all the water is used in the beginning, often sticky masses of yeast will cling to the sides of the blender. In addition the blender may be used for preparing fungus, malt sprouts, fruit, etc. for addition to base media if desirable.

Mainland, G.B. (2) The use of low temperatures to inhibit the emergence of adult flies. At times it is inconvenient to collect virgin Drosophila females at the required intervals, especially in those forms mating four hours after emergence. By storing the bottles or vials containing pupae about ready to emerge in a refrigerator at 2 to 5° C., it is possible to prevent the emergence of adult flies. Upon warming to about 21° C., normal adults usually emerge rapidly, especially if they are stored for several days. If the pupae are stored at 7 to 10° C., some adults will emerge while in the refrigerator; such adults while virgin often display various wing and body abnormalities, phenocopies of various mutants. Caution is advised against freezing, since this is lethal to the eggs, larvae, pupae, and adults of *D. melanogaster* and various other species; however, freezing of pupae is non-lethal to many nearctic (northern temperate) species although lethal to their eggs, larvae, and adults. Pupae of *D. melanogaster* may be stored at 2 to 5° C. several weeks without adults emerging; however, some of the larvae present may die during this interval, especially if the food is somewhat soft and flows slightly. Adult virgins may be stored at 4 to 7° C. for periods upward of a month with very little aging.

Mainland, G. B. (3) The prevention of suicides of newly emerged adults.

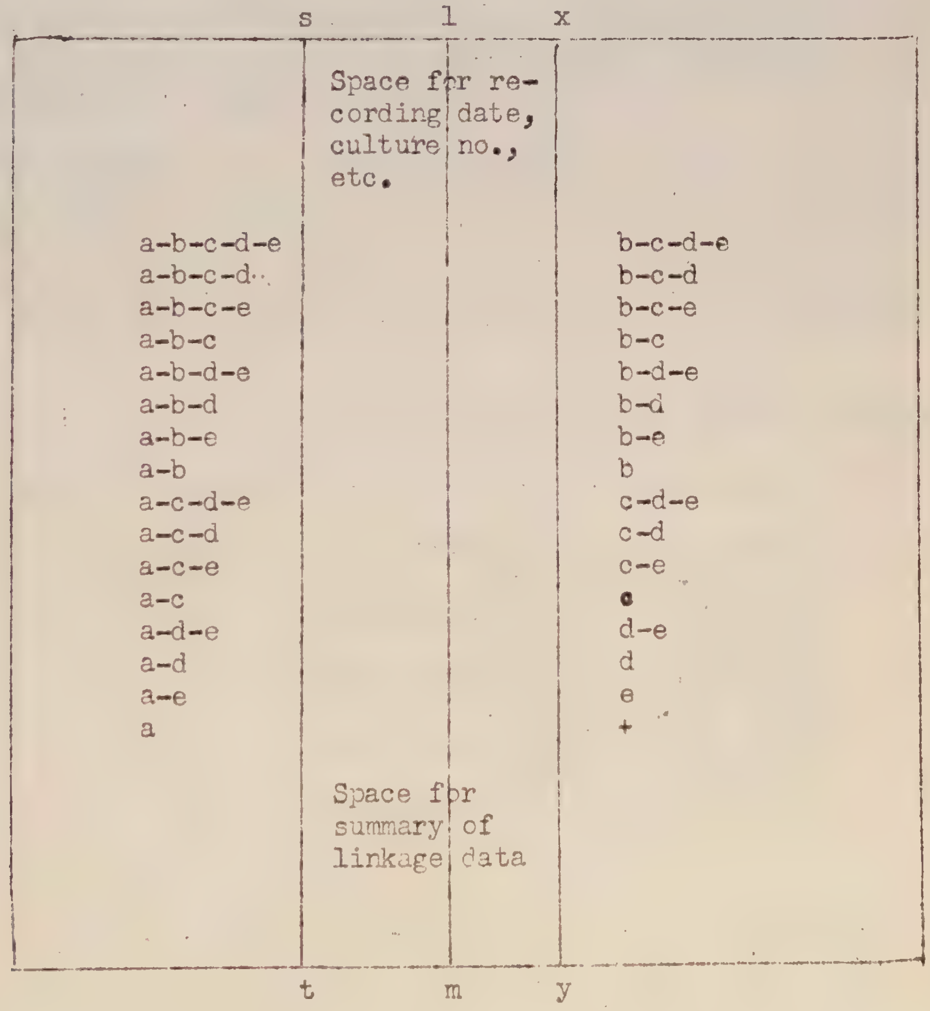
Various species of Drosophilids have a characteristic manner of comitting suicide by crawling up between the cotton stopper and glass vial or bottle shortly after emerging from the puparia. Becoming entangled in the cotton and being unable to progress forward or backward, they die. In some species more than 90% of the flies may die in this manner. To prevent this, one may use cardboard milk bottle tops instead of cotton in bottles; however, bottle tops are very ineffective in preventing mite contaminations. Another method, which is mite-proof, is to cut a square of paper toweling, place it over the top of the vial or bottle, firmly band the paper toweling in place with a rubber band, and finally gently draw the toweling downward until it is taut. Cultures develop normally under such toweling tops.

Mainland, G. B. (4) Freeing cultures of pink mites.

Mite-free adult Drosophila may be obtained easily from bottle cultures contaminated with pink mites at the time adults are ready to emerge from the puparia. The method is as follows: (1) remove and destroy the stopper, (2) remove and kill adults, (3) invert the bottle and thoroughly swab the inside to within 1.5 to 2 cm. of the food with a cotton swab liberally dipped in ether (ethyl ether), (4) blow the ether fumes out of the bottle, (5) replug the bottle with a new stopper, (6) collect emerged adults every 12 hours, and then repeat all steps except (2). It should be noted that all paper toweling projecting upward should be removed or pushed into the food for this technique to be effective. The efficacy of this method results from two facts. First, liquid ether is an efficient contact lethal agent for arthropods, and it does not produce after-effects subsequent to the removal of its fumes. Second, white mites undergoing metamorphosis into the pink contagious stage crawl upward during metamorphosis, and although present in early pink stages at 12 hours after leaving the food, they will not attach themselves to flies.

Spencer, W.P. A method of recording linkage data.

The following method has been found convenient in recording data in large-scale linkage experiments involving five- or six-point crosses, and is equally applicable to experiments where fewer loci are followed. The first page in a ruled spiral stenographer's note book is divided into equal parts by two lines drawn from the top to the bottom of the page, the lines s-t and x-y in the sample page shown below. If the linkage experiment involves five loci, the 32 possible combinations of mutant and wild-type characters are arranged for the greatest convenience in recording and not according to the position of loci in the chromosome map. Thus if the mutant genes are a-b-c-d-e and their wild-type alleles A-B-C-D-E, the classes will be recorded as shown in the diagram. Only the mutant symbols or names need be written in. The symbol of the most easily and quickly separable mutant should be substituted for a, that of the next most easily separable mutant for b, and so on. The symbol of the mutant most difficult to separate should be substituted for e. Flies from a culture are etherized and separated first into a and A groups. The A group is placed in a vial and the a group separated into b and B groups and so on. The most difficult separations are made when there are only a few flies left in a group. The initial number of flies and the difficulty of the separations will determine the number of sub-groups which must be placed in vials for re-etherization. Generally 4 to 8 classes of flies can be handled on the counting plate and recorded after the first separations have been made. The center area between the lines s-t and x-y is used for recording the flies by check marks. The blue line l-m separates all classes containing a from those containing A. The arrangement of the classes on the page facilitates recording. Enough room is left at the top of the page for recording culture number, date, and other pertinent data and at the bottom of the page for a summary of linkage data. The page is then cut along the lines s-t and x-y and turned back. The next page is ruled in the same way with two vertical lines, but the 32 classes on the two strips remaining in place from page one are again used for recording the flies on the center strip of page two. Notes or summary of linkage data may also be written on the back of each center strip. Once the order of the genes is known, appropriate masks can be cut from light cardboard, which when laid over the center strip will allow only the crossover classes between a certain pair of genes to be seen and the counts can be made very quickly for determining their linkage value. A sixth point may be followed by marking the two alleles in red and black respectively. Linkage data involving 20,000 to 25,000 flies and five- or six-point crosses can be recorded in one such notebook and filed away in compact and easily accessible form.



Space for recording date, culture no., etc.

a-b-c-d-e	b-c-d-e
a-b-c-d	b-c-d
a-b-c-e	b-c-e
a-b-c	b-c
a-b-d-e	b-d-e
a-b-d	b-d
a-b-e	b-e
a-b	b
a-c-d-e	c-d-e
a-c-d	c-d
a-c-e	c-e
a-c	c
a-d-e	d-e
a-d	d
a-e	e
a	+

Space for summary of linkage data

Hill, David L. Chemical removal of the chorion from Drosophila eggs.

Slifer (1945) has reported that sodium hypochlorite can be used for removing the chorion from the eggs of the grass hopper, *Melanoplus differentialis*. This substance does not affect the chitinous cuticle of these eggs. It was felt that chemical rather than manual methods would be useful tool for geneticists and embryologists using Drosophila as experimental material. The results of applying this technique are reported herein.

Using eggs of *Drosophila virilis* it was found that the optimum conditions of exposure to sodium hypochlorite were of the same order as those found by Slifer (1945) for the egg of the grasshopper. Thus an exposure of 2 minutes in a 3% solution of sodium hypochlorite (commercial preparations such as Chlorox or Dazzle are satisfactory) was found to completely remove the chroion without subsequent harm to the embryo or delay in the time required for hatching.

The eggs were washed, prior to removing the chorion, to free them from the medium in which they had been laid. Likewise careful washing with water followed the treatment with hypochlorite. For ease of observation the eggs were placed in rows on 1% agar which had been blackened with India ink.

Apparently the stage in development at which this treatment was applied was of little importance, since eggs treated before the sixth hour responded in the same way as eggs treated between the 24th and 30th hours. The temperature was not rigidly controlled, being only approximately 25° C.; however, this variable was compensated for by subjecting untreated eggs to the same temperature conditions and comparing the percentage hatching in each.

The following table shows the results obtained:

No. eggs	Stage	Treatment	% Hatch
100	0-6 hrs.	Control	92
100	0-6 hrs.	Sodium Hypochlorite	85
100	0-6 hrs.	Control	83
100	0-6 hrs.	Sodium Hypochlorite	83
100	24-30 hrs.	Control	86
100	24-30 hrs.	Sodium Hypochlorite	88
100	24-30 hrs.	Control	88
100	24-30 hrs.	Sodium Hypochlorite	94

This technique has certain advantages: (a) It makes it possible to dechorionate any number of eggs simultaneously in the time it take to dechorionate only a few by hand. (b) Subsequent development can be observed through the cuticle without further disturbance to the embryo. (c) It affords an opportunity to study the relative importance of the chorion and the cuticle to the egg as a whole.

Reference: Slifer, Eleanor H., 1945, Removing the shell from living grasshopper eggs. Science 102: 282.

Research Notes

Alikanian, J. The maternal effect. While studying mutations in the left end of the sex chromosome of Drosophila melanogaster, I obtained in 1940 a rather interesting lethal mutation - $\underline{l}76$ (for details of my method of obtaining lethals see Zoological Journal N). Males carrying the lethal mutation never emerged if there was no deletion in their genotype. Females homozygous for this lethal were fully viable, fertile, and for obtaining offspring were further mated with lethal males, always carrying a deletion. In the progeny there always appeared both wild-type females (carrying the deletion) and yellow females (without the deletion) homozygous for $\underline{l}_{76}$. A thorough genetical analysis of the lethal was carried out by me, but unfortunately all the experimental records were lost during the war. It is of peculiar interest to note one phenomenon - the existance of tumors in larvae. The time of action of $\underline{l}_{76}$ in males was rather late and was manifested in adult larvae up to pupae formation. All such larvae possessed tumors in the form of free-lying formations in the body cavity. Their shape and dimensions varied. The color varied from brown to black. The larvae without the deletion are yellow. There is another interesting feature. The larvae of males carrying the tumors mentioned above appeared only in the progeny of females homozygous for $\underline{l}_{76}$ and not carrying the deletion 215. No larvae with tumors were found in the offspring of females carrying the lethal and the deletion 215. This is an interesting example of the maternal effect. It is necessary to point out that these tumors appeared in larvae in the process of their growth, so that larvae that were at first normal began after a few hours to manifest tumors.

Barigozzi, C. and Trapani, E. (unpublished data). Wing bristles in wild samples of melanogaster from Luino, Civate, and Gaiano were counted in order to determine the cell size. The three samples are significantly different. Through reciprocal crosses a maternal effect is demonstrated. Cell size in males is smaller than in females, but the entity of the difference varies in the three strains. It seems to prove an influence of the Y chromosome.

Bird, M. J. X chromosome of Drosophila subobscura. 0 m (miniature). 14.5 pm (plum). 32.5 ct (cut). 68.5 bg (bulge). 86 sn (singed). 91 cp (copper). 128 c(X) (crossing-over suppressor). 136.8 bnz (bronze). 138 lethal I(1)40j, lost. 143 v (vermilion). 143 cv (crossveinless). 147 dw (dried wing). 155 lethal I(1)41 K, lost. 169 N (Notch). 183 lz (lozenge). 191.6 w (white eye). 198.2 y (yellow). 198.6 sc (scute). 198.7 scl (short costal). 200.2 wi (withered wing). 220? bb (bobbed), lost.

The order of v and cv is as given; the distance is about 0.14 unit. The order of sc and scl is uncertain. lz and w are male sterile, as visual stimuli are needed for mating in this species. Hence lz cannot be combined with N, and the distances between cv and w are doubtful, as is that between cp and cv, which give 39.7% crossing over. The distances given are in general longer than the recombination values, an allowance being made for multiple crossing over. The homology of m, ct, v, N, lz, w, y, sc, and bb with the corresponding melanogaster genes is highly probable. Some other genes have been lost after partial location. In two six-point counts in which m and pm segregated with ct sn cp v sc, 3 flies in 2839 showed fivefold crossing over.

Bird, M. J. (2) A gene affecting the male genitalia in *Drosophila subobscura*. A wide range of structural defects occurs in the male genitalia of cv^2, but not of cv^1, which produces indistinguishable effects on venation. The normal organs differ from those of D. melanogaster mainly in that the testes are slightly elongated ellipsoids of a bright orange color. The most abnormal form has two spherical testes, but no ducts, sperm pump, or external genitalia; the least abnormal form has one colorless degenerate vas efferens still attached to a testis. The commonest abnormal types are: (a) Right and left sides separate, each consisting of a vas efferens joined proximally to a testis and distally to a paragonium; no vas deferens. (b) One testis detached and spherical, the other joined at one point to two vasa efferentia each ending in a paragonium, no vas deferens. In both types the system floats loose in the body cavity, and there may be a small reduced sperm pump. Detached testes are colored, and in the few cases where a vas efferens was not attached to a testis it was still colored. The percentage of abnormals in cultures from brother-sister matings ranged from 40.7% of 221 flies to 8.4% of 155 flies. In five generations of inbreeding it has not fallen systematically, so there has been no selection of modifiers.

Bonnier, G., Rasmuson, B., and Rasmuson, Marianne The Bar facet number. The mutant Eb, described by Bonnier, Nordenskiöld and Bagman (Hereditas 29: 113-133, 1943; earlier symbol in DIS-16: i; in Bridges and Brehme, The mutants of Drosophila melanogaster, denoted by I) occurred in a homozygous B female with attached-X's. After detachment linkage tests showed Eb to lie very close to the right of B. Salivaries showed that the Eb chromosome has lost one of the two B segments. The phenotypic effects of Eb were found to be: Eb/+ gives round eyes, whereas Eb/B and B Eb/+ give eyes of the homozygous B type. Before making facet counts the strains were made homozygous and isogenous by marking the X with a number of known recessive mutants and by repeated brother-sister matings. It was then found (*cf.* Hereditas 29, 1943) that the original Eb/B females had an average of 84.27 facets per eye, and the B Eb/+ an average of 40.57. In the new strains of Eb/B, which were received after crossing over in the B Eb/+, the average facet number was 89.97. The chief interest lies in the fact that, though the original and the recovered B/Eb strains have facet numbers of the same orders of magnitude, yet the difference is statistically significant.

This problem has been tested further. Again a very great number of generations (not counted, but probably more than 100) of strong inbreeding preceded the experiment. From the above-mentioned strain of B Eb/+, with an average of 40.57 facets per eye, which now acted as the original one, three new strains were secured through crossing over at 3 different instances (strains nr 1, 2, 3). From strains 1 and 2, strains of B Eb/+ were again secured by crossing over at different instances (strains 1C, 1E, 1F, and 1H from strain 1, and strains 2T, 2U, 2V, and 2Y from strain 2). From all these strains counts were made of the facets of the right eyes of females, bred simultaneously in the same incubator. The results were as follows

Type	Strain	No. of the eyes counted	Average No. of facets
B/Eb	1	446	69.32
"	2	411	66.65
"	3	74	98.87
B Eb/+	Original	92	39.67
"	1C	372	42.99
"	1E	387	39.61
"	1F	19	54.55
"	1H	313	40.47
"	2T	411	42.16
"	2U	378	46.43
"	2V	118	56.24
"	2Y	178	40.18

To this it must be added that in one single culture bottle of the original strain B Eb/+ a decisively different number of facets was found - viz., 30.70 (40 eyes). This bottle is not included in the above record. Disregarding this bottle (it will be discussed, and a more detailed description given, in a later publication), it is found that the difference between the old and the new counts in the "original" strain of B Eb/+ - viz., 40.57 - 39.67 - is statistically insignificant. On the other hand, differences that are statistically very significant are found between the different B Eb/+ strains, and it can be shown that they are not wholly due to environmental causes.

Gersh, Eileen Sutton Chemically induced phenocopies in *D. melanogaster*.

Flies of Oregon-R stock were raised on food containing (1) potassium arsenite (about 0.03% by weight), (2) boric acid (about 0.05% by weight). Eggs or larvae were transferred to the special media within 48 hours of laying. Small numbers of adult flies were obtained, which showed the following effects: (1) Effects of $KAsO_2$. (a) Dull and somewhat wavy wing surface in 16 out of 29 flies (ca. 55%). (b) Grade I melanism: very dark trident, accessory longitudinal stripe on each side of trident, and pigment at posterior end of scutellum in 16 out of 29 flies (ca. 55%). (cf. mutant ptg.) (c) Grade II melanism: very dark trident and accessory lateral stripe, but no scutellar pigment in 9 out of 29 flies (ca. 31%). (d) 5 out of 29 flies (ca. 14%) completely normal. (2) Effects of H_3BO_3. (a) Melanotic tumors in an undetermined proportion of larvae. (cf. mutant l(1)7.) (b) Reduced eyes of various grades up to completely eyeless in 6 out of 21 flies (ca. 29%). (cf. mutant ey). (c) Abnormal aristae in the 4 flies with greatest reduction of eyes (ca. 19%). (cf. mutant ss^a.) (d) 15 out of 21 flies normal. At higher doses fewer flies were obtained, but a larger proportion of abnormalities. Allowing for differences in the dosages used, it may be considered that these results provide substantial confirmation of those published by Rapoport (Bull. Biol. et Med. Exp. de l'URSS. 7: 415, 1939), at least with regard to the effects of arsenic and boron compounds.

Gloor, H. Phenocopies of tetraptera and bithorax mutants.

By treating Drosophila eggs at an early embryonic stage (within 2-4 hours after oviposition) with chemical agents, mainly ether, it is possible to obtain in a considerable percentage (up to 40%) adult specimens with the metathorax modified in a characteristic way. The sclerites, legs, and halteres resemble in a variable degree the corresponding organs of the mesothorax.

Thus it is evident that those modifications arising from ether treatment may be considered as phenocopies of the mutant characters tetraptera, bithorax, etc. In very extreme cases a complete and in most details normal-looking second mesothorax instead of a metathorax is formed. In our laboratory H. Niggli obtained a similar effect by treating eggs with a phenol solution.

Hinton, Taylor Salivary chromosomes of irradiated larvae.

Eggs and young larvae of *Drosophila melanogaster* were treated with X-rays. Just prior to pupation half of the larvae were taken from the culture bottle and smear preparations made of the salivary glands. The other larvae were allowed to pupate and hatch. Of the 70 that hatched, 7 showed malformations in the development of the eyes, legs, or wings. Examination of the salivary-gland chromosomes of the first group of 100 larvae failed to reveal any chromosomal disturbances, even though a search was made for small aberrations.

Hinton, Taylor (2) Further study on position effect in In(2LR)40d.

A more detailed analysis than was first made of the effect of temperature upon the phenotypic expression of this inversion shows no significant effect of temperatures ranging from 15° to 26° C. However, the severity of the effect on the offspring is increased with the aging of the parents. The effect is also increased in individuals heterozygous for clot and the inversion, but decreased in individuals heterozygous for In(2LR)40d and the Cy inversion. The effect of age and other inversions is being tested further.

Lieb, Margaret, Valencia, J., and Muller, H. J. New translocations between the X and 4th chromosomes.

Using Dubinin and Sidoroff's technique of crossing irradiated males to females containing cubitus eyeless and looking for cubitus among the offspring, we have during the past year obtained stocks of fifteen translocations between the X and 4th chromosomes. Approximately 9000 F_1 females were examined, derived from fathers given 3500 to 5000 r of X-rays. In five of the X4 translocations the male is both viable and fertile, and in four of them the break lies in the euchromatic region between the loci of yellow and forked, and has been determined cytologically. The breeding work was done by Lieb and the salivary examinations by Valencia. Before the salivary examinations were made, the positions of the breaks had first been determined approximately by crossing the males to females having attached X's containing various marker genes. The positions of the breaks in the salivary chromosomes of the four stocks are as follows: 4C3, 9A1, 11A7, 11B16. In addition to these four, a salivary examination has been made by Valencia of the X4 translocation which Sidky found while at Edinburgh, and which is commonly designated as "Sidky a." This break is approximately at 13B8-9. In view of the loss of almost all of the X4 translocations designated by the symbol A, possession of the above translocations fills, we believe, a present need. In addition to these translocations numerous translocations were found between the second or third chromosomes and the fourth, but no attempt was made to locate the position of the breaks in these cases. They have been sent to Dr. Griffith, of the University of Missouri, and we understand that he will subject some of them to salivary examination.

Milani, R. Induction of mutations with Na_3PO_4.

In 1941 I tried to induce mutations in *D. melanogaster* by treating with sodium phosphate. Measuring the frequency of lethals on the X chromosome by the ClB method, I obtained; (a) Normal eggs in 11% solution during 7 hours 30 minutes: 4 lethals over 1047 chr. (0.38%± 0.19).

(b) Dechorionated eggs in 11% solution during 5 hours: 2 lethals over 477 chr. (1.76 ± 1.22).. (c) Feeding (10gr. in 480 of food): 13 lethals on 477 chr. (d) Control (in Ringer): 3 lethals on 545 chr. (0.55 ± 0.32). In (c) each of 3 males gave more than 1 mutation (2-2-3). Although the number of chromosomes tested is small, the results reached in the feeding experiences are significant, I think.

Moree, Ray. Probable X detachment and phenotypic elimination. Several + w^e females were discovered in stock y ♀ x w^e ♂ (y + ♀ x + w^e ♂). New w^e females replaced and eventually eliminated y males; several y females were recultured without w^e females to prevent loss of original stock. Since productivity of w^e females is about twice that of y females, w^e females probably result from detachment of X chromosomes. Cytological examination to be made as soon as microscope is available.

Morgan, L. V. Loci of sv^n and ey^2. It is known that the loci of sv and ey lie outside the range of Df4(M)4 in the fourth chromosome. The region that includes the loci has been more narrowly defined by use of the 4-2L fragment of T(2;4)b. The break in chromosome 4 is proximal to 102D1 in the distal range of 102C (Lewis, U). Flies homozygous for normal second chromosomes and carrying the 4-2L fragment and one mutant fourth chromosome were recognized as hyperploids by somatic characteristics. They showed exaggeration of the mutant, sv^n or ey^2, indicating that the loci of both of these mutants are distal to nearly all of region 102C.

Muller, H. J. Two mutants of mosaic expression not caused by gross rearrangement of heterochromatin. It was reported by the author in 1935 (Proc. 15th Internat. Physiol. Cong.: 587-589) that the curious mosaically expressed mutations in D. melanogaster, of X-ray origin, which he had earlier found (Am. Nat. 64: 245-246, 1930) to be associated with structural changes, and accordingly called "eversporting displacements," always involve a placing of the affected genes near to a "chromocentral" (now usually called "heterochromatic") region--a finding later concurred in by Schultz (Proc. Nat. Acad. Sci., 22: 27-33, 1936). Demerec on the other hand had still earlier (Proc. 4th Internat. Cong. Plant Sci. 1: 943-946, 1926) reported several cases of mosaically expressed mutations of spontaneous origin in D. virilis, which were not associated with gross structural changes and which gave evidence of being of a different nature, dependent on an unstable condition of the affected genes themselves. We have now found two cases in D. melanogaster, one spontaneous and one induced by X-rays, in which there is an appearance of somatic mosaicism much like that in the rearrangements involving heterochromatin, but in which there is no evidence of a structural change of microscopic dimensions having occurred, and certainly no gross change involving heterochromatin. As both stocks appear to be stable, there is no evidence of germinal mutability. It is conceivable that one or both cases are similar to Demerec's miniature gamma in virilis, for which there is good evidence that there is high gene mutability but that this is confined to somatic tissue; but it is also conceivable that the mosaicism is purely a gene manifestation in our cases (as in some mammalian spotting), or involves some semipermanent change like that in the eversporting displacements, if not some new phenomenon.

One of these cases (that of spontaneous origin) involves a mutation of a locus that had presumably been normal to an allele designated as mw, and called "mottler of the white series" (or "mottler" for short). This is a recessive sex-linked gene with locus near (within a few units of) vermilion, but not allelic to it. In an otherwise normal genotype this mutant gene produces no visible effect, as it is--like the various mutants called "cream" a, b, etc., discovered by Bridges--a specific modifier of apricot and of other alleles of intermediate expression belonging to the white-locus series. In connection with these, it makes the color much lighter, especially in the female. Unlike what is found with Bridges' specific modifiers, however, the color is made patchy, and greatly resembles that of many of the lighter mottled alleles of white that are caused by the juxtaposition of the white locus to heterochromatin. And as in those cases, there is a considerable variation between individuals, as well as between the two eyes of the same fly, though also a positive correlation between the latter. Classifiability always seems possible, however.

The other mutant, X-ray induced, involves the mutation of what was originally the normal allele of forked bristles to an allele called f^m ("forked-mosaic"). Again the flies vary considerably from one another, many seeming like ordinary forked but a high percentage showing coherent patches of the body, often of considerable size, in which the bristles are quite normal; and occasionally practically the whole fly seems normal. Stocks phenotypically like this were obtained in abundance in Belgovsky and Muller's work (Rec. Gen. Soc. Amer. 6: 139-140, 1937) in which a heterochromatic inversion of Bar (B^{M1}) was irradiated, but here the heterochromatin had presumably been involved (as in the yellow effects of scute 8 studied by Nuzhdin). In our present case, on the other hand, the crossing-over tests made so far indicate f^m to be in the usual location for f^+, and to have approximately normal crossover frequencies with other loci. Moreover, salivary examinations by J. Valencia have given evidence of not even a minute (microscopically visible) rearrangement.

Both cases are being followed further. Among other things, it is desired to determine what effect, if any, is produced in them by the presence of an extra Y.

Postscript (added October 7, 1946): Since the above was written, it has been found that the stock of forked-mosaic, although possessing a certain germinal stability in appearing not to mutate frequently all the way to normal, does within certain limits, to be more accurately determined later, have some tendency to inheritable variation in the germ cells. That is, it responds to selection, and does so in a way not readily to be explained by the segregation of modifying genes or of a Y chromosome. This would seem to place it in the general category of unstable genes such as those reported by Demerec referred to above, and would make it the first case of the kind in D. melanogaster.

Novitski, E. Triploidy in D. pseudoobscura. To detect triploidy in D. pseudoobscura, ♀♀ of the constitution or Bl Sc pr/Inv (Cuernevaca) were mated to or ab pr ♂♂ and the F_1 non-or pr ♀ were examined for evidence of Bl and Sc (presumed genotype or ab pr/or Bl Sc pr/Inv (Cuernevaca)). Out of 13,068 non-or pr ♀ , one showed slight Bl and Sc characters and in addition had the coarse bristles and large wing cell size characteristic of triploids. When backcrossed to an or ab pr ♂, she produced two or ab pr ♀ , one or Bl Sc pr ♀ (2N), one + ♀ (2N), and one + ♀ (3N). The constitutions of the F_1 indicate that three of the autosomes marked were present in the parental ♀ . The F_1 triploid x or ab pr ♂ yielded one or ab pr ♀ (2N), one or ab pr ♂(2N), and three + ♀ (all 2N). An oogonial metaphase of one of the latter showed that she was XXY.

The very low fertility of the 3N ♀ and the failure to perpetuate the triploid condition is undoubtedly caused by the larger number of chromosomes (five in pseudoobscura as compared with four in melanogaster), which leads to a larger percentage of unbalanced zygotes. No intersexes, supermales, or superfemales were obtained; it seems likely that the[10] viability of the 2X3A, 3X2A, and 1X3A zygotes is much greater in pseudoobscura, where the X chromosome contains roughly twice as much euchromatic material as in melanogaster.

Philip, U. A. Cytology of males in cultures with recessive crossover suppressor.

Thirty-one males from 5 mothers homozygous for the sex-linked crossover suppressor c(X^2) (see note by H. Spurway) were examined. The results were:

Mating	Patroclinous Males		Regular Males				
	XO	XY	XO	XY	XYY	XYYY	XYYYY
XX or XXY ♀ x XYY ♂	1	0	0	3	5	0	0
XXY or XXYY ♀ x XY ♂	3	5	4	7	1	1	1

The male with 4 Y's had also 3 dot chromosomes, and no external genitalia. In addition, five other males hemizygous for c(X) were examined. Three were XY, one XYY, and one XYYY. XXY females form eggs containing all 3 or none of the sex chromosomes, producing XO exceptional males and XXYY exceptional females. XXYY females produce XYY eggs, giving rise to XYYY sons when mated to XY males. Meiosis in c(X) males is not much modified. The chromosomes lag at anaphase. But no unexpected chromosome numbers were found in cells undergoing second meiotic division. Pairing at metaphase I is complete. In males with more than one Y chromosome, including that with 4 Y's, all the sex chromosomes form a multivalent, the Y's associating with the X near the centromere. The association between X and Y is obviously not due to chiasma formation. In crosses between XXY females and XYY males using other stocks no XYYY males were found among large numbers. No male in the progeny of c(X) c(X) females was found to be trisomic for one of the long autosomes, though such males had been obtained before.

Poulson, D. F. and Boell, E. J. Cholinesterase in embryonic tissues of Drosophila.

Experiments carried out by means of the Cartesian diver technique provide information on the development of cholinesterase activity in normal and deficient zygotes. ChE activity is negligible in normal and Notch-deficient zygotes 10 hours of age or younger (at 23° C.) and in unfertilized eggs. ChE activity increases between 10 and 14 hours and rises rapidly until time of hatching of normal larvae. At 24 hours the ChE activity in normal embryos averages 12.8 m.μ.l. CO$_2$/embryo/hour; in N^8 embryos (male) it averages 34.0 m.μ.l. CO$_2$/embryo/hour. The activity of N^8 embryos is 2.7 times that of normal, which is very close to the ratio of volumes of nervous systems at that time. N^8 embryos have a higher ChE activity from the time that this is first measurable, between 10 and 14 hours. Activity rises considerably after 24 hours in N^8 embryos and reaches a maximum of 56.0 m.μ.l. CO$_2$/embryo/hour at 40 hours, after which it declines until the death of the embryo. Central nervous systems were isolated from the rest of the tissues in normal embryos and larvae at 18.5 and 24 hours, and ChE activities of nervous system and remnant were determined separately. ChE activity in the nervous system is roughly 40 times that of the rest of the tissues. The method is sufficiently sensitive so that it is possible to carry out determinations on single isolated nervous systems as well as on single embryos. The results will be described in full elsewhere.

Rendel, J. M. and Suley, A. C. E. Eye buds from larvae of a cardinal subobscura stock injected into larvae of wild-type melanogaster and subobscura stocks, gave implants indistinguishable from the host-type eye. Injected into v melanogaster hosts, the implants were cd. As cardinal is sex-linked, it is probably homologous with vermilion. The name has therefore been changed to vermilion. Preliminary experiments suggest that poppy and scarlet are autonomous in + melanogaster and are therefore not homologous with cn. But these results require confirmation.

Spurway, H. An extreme example of delay in gene action in D. subobscura. Females homozygous for the autosomal recessive grandchildless (gs) themselves appear normal but produce cultures in which all the flies are sterile, irrespective of the male to which they are mated. gs/gs males are normal and produce normal offspring (unless mated to a gs/gs female). The abnormality is transmitted as an autosomal recessive through both males and females. The locus is in the 3rd linkage group with hoary, rough and net. Almost all the sons of a gs/gs female have minute spherical testes like those found in miranda x pseudoobscura hybrids. No cell divisions can be found (Philip). About 3% of these sons have one or two normal testes. These are normally fertile. No intermediates have been found. In the daughters of gs/gs females the ovaries remain in the condition they normally show in young pupae (Fahmy). No fertile or probably fertile females have been found. One of our lines containing the condition, now at the F_{13}, has become balanced. It is interesting to compare both the anatomical effects and the mode of inheritance of this gene with those postulated by Dobzhansky to explain sterility in his pseudoobscura hybrids.

Spurway, H. (2) A sex-linked recessive crossover suppressor in D. subobscura. Females homozygous for a recessive gene c(X) 6 units from cv and v produce 18% of exceptional offspring. These females may themselves be matroclinous and therefore XXY, or they may have been obtained in the F_3 from the cross c(X) XY ♂ x +/+ XX ♀, and therefore XX. In such females crossing over in the X and the three autosomes in which it has been examined is reduced to about 3% its normal value. The salivary-gland chromosomes have not been examined, but crossing over in c(X)/+ females is normal. There is little heterogeneity among the progeny of different c(X)/c(X) flies, and male and female exceptions occur in equal numbers. Philip gives other data confirming that it is a recessive disturbing disjunction and that its effect is confined to females. The analogy with Gowen's gene c(3)G in melanogaster is obvious.

Vogt, Marguerite. Endocrine factors in Drosophila. Studies on the function of the ring gland led to the distinction of several factors produced by the gland; i.e., a factor producing metamorphosis and probably secreted by the "large" ring-gland cells, a gonadotropic factor, produced by the "small" cells (= corpus allatum) and possibly also having an inhibitory effect on metamorphosis, and a factor inhibiting the coloring process of the puparium and delaying the time of puparium formation, secreted by the "fuchsinophilic" ganglion cells (= copora cardiaca). Further, a hormone produced by the ripening ovary was found; it inhibits the secretion of the corpus allatum and accelerates the metamorphosis of imaginal discs.

Vogt, Marguerite (2) Studies on the state of determination of the larval imaginal discs in Drosophila. Reduplications of legs, antennae, palpi, ocelli and supernumerary facets were obtained by dividing the imaginal discs up to the first half of the last instar. These results, together with the investigation of the "temperature-effective" period of the mutants aristopedia (ss^a), proboscipedia (pb), and of the gene combination sc, ec, ct; Lfd^{r}-Lüers, which leads to duplications of antennae and palpi, lead to the conclusion that the imaginal discs of Drosophila are not finally determined by the last instar. The regulating power, however, as well as the capacity for changes in differentiation, does not extend to the imaginal disc as a whole but is restricted to the "organ-fields" within the imaginal disc.

Technical Notes

Hughes, Roscoe D. Notes on mites infesting Drosophila cultures. Some observations on a species of mite commonly infesting Drosophila cultures are recorded here as being of possible interest to Drosophila workers. The stocks upon which these observations were made were found in a Drosophila culture obtained from one of the biological supply houses. Dr. H. H. J. Nesbitt has tentatively identified these specimens as belonging to the genus Anoetus (Histiostoma), family Anoetidae. The species which has been studied is similar to the species gracilipes (Banks). It is also very probable that the species in question is the same as that named Histiostoma genetica by Stolpe. (Anat. Rec. (Supplement) 72: 133-134). The mites were reared satisfactorily on any of the Drosophila culture media in general use. The standard cornmeal-molasses-agar medium was used predominantly in these studies. The adult male mite may be readily distinguished from the female by the greater thickness of the posterior pair of legs of the former, and the relative uselessness of these legs in crawling over the surface of the medium. This pair of legs is dragged behind in an extended position. The thinner, more fragile posterior pair of legs of the female is used in crawling movements, although to a lesser extent than her first three pairs of legs. Also the adult male is distinguished from the adult female by his smaller size, although this is a variable character. Under favorable conditions--i.e., with freshly made food and a saturated atmosphere--the life cycle of this species may be completed within five days. The normal life cycle, however, appears to be about six days under average conditions. Parthenogenesis definitely occurs in this species. The offspring of unfertilized females (obtained from isolated eggs) are all males. Thus a single female-producing egg, inadvertently transferred from a contaminated Drosophila stock, may be the starting point of a new colony. The nonmigrant form rarely leaves the culture medium except under very crowded conditions. On exposure to normal laboratory atmospheric conditions, the nonmigratory form becomes desiccated in a short time. For the above reasons it is doubtful that this form is an important source of contamination. From the limited observations available at this time, it appears that the longevity of the nonmigrant form is approximately fourteen days or less. The migrant is the real source of contamination in Drosophila cultures. It appears that certain six-legged larvae, or possibly first-stage nymphs, metamorphose into small pink forms, which are especially well adapted for distributing the species. These migrant forms are much more active than nonmigrants, and, when they first make their appearance in a culture, tend to crawl away from the culture medium. They resist desiccation considerably longer than non-migrants, but thrive best under moist conditions. A favorite collecting place for migrants is on the under side of culture-bottle caps.∧ The migrants have survived in vials of water for over two months at room temperature. It is probable that they may survive for even longer periods under favorable conditions. Eventually the migrant forms metamorphose into either male or female nonmigrant forms. Migrants do not occur in large numbers when culture

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∧ The migrants (hypopial stage) possess a sucking disc on the ventral surface, which is used in attaching to Drosophila. They possess no mouth parts.

conditions are favorable. Under crowded conditions, especially in old stock bottles, they may occur in enormous numbers.

Moree, Ray. A long-boiling culture medium. In order to overcome difficulties of sterilization and storage we have developed the following culture medium. Water 1000 cc., plus agar-agar 20 cc. (9 grams); molasses 150 cc.; mix cornmeal 100 cc., brewer's yeast 30 cc., sodium propionate 10 cc., then slowly add water 140 cc. Agar-agar is dissolved by heat, molasses added next, and cornmeal-yeast-propionate mixture added last. Boil gently, with intermittent stirring, for about one hour; pour into bottles, plug, and steam-bath for one hour. Agar-agar is powdered type, and all measurements of solids are "loose measurements" (i.e., not settled or tamped). One hour of boiling sterilizes satisfactorily and usually gives right consistency to medium; consistency may have to be adjusted by more or less boiling. Some ingredients have given much trouble with bacteria, and sometimes mold--hence the long boiling period. Steam bath (in galvanized can) has proved better than dry heat of baking oven for sterilizing. If cornmeal settles, medium should be shaken up before it solidifies. Cultures are easy to make and suffer a minimum of contamination by microorganisms; when moistened occasionally with distilled water, they have been kept unrefrigerated for one month andlonger without spoiling.

Muller, H.J. Stock list: changes in manner of classification. Instead of numbering our stocks consecutively from beginning to end as in the past, we have divided them up into a number of groups each designated by a small letter and have numbered them within these groups after arranging them pretty much on the usual alphabetical basis within the groups (but see modification noted in second paragraph). This arrangement has several advantages: first, the stocks are more easily found after one becomes acquainted with what groups the letters stand for; second, when stocks are added to or subtracted from the original list there is not nearly so much disturbance of the numbering. Moreover, the addition of the letter, instead of making the designation of the stock a longer one, actually makes it on the average a little shorter, in the case of a long stock list, owing to the fact that there are more than ten letters in the alphabet.

We have also inserted a new column between the number of the stock and the designation of its genotype, entitled "Signal." This we use in two cases. First, in case a stock is a complicated one, which would not readily be found by looking for it in its regular place in the alphabetical scheme, as happens particularly when the first gene in the formula is not the one which we think of as most characteristic of the stock and for the purpose of keeping which the stock is maintained. In that case the signal is so chosen as either to represent or suggest the characteristic gene or genes, or else consists of a made-up word or phrase such as "plex" or "rucuca" or "Cy Fl only," chosen so as to suggest, in abbreviated form, the stock's composition or purpose. The second use of the signals is encountered in cases where, although the stock is not a complex one, it is being kept for the sake of some gene or genetic combination with which the formula does not begin and which, therefore, would not be easily found in the stock list when the latter is represented in the alphabetical order. Thus, for example, in our stock list there are a number of combinations containing the heterochromatic inversion associated with the bar mutation called B^{M1}. Instead of scattering these around through the stock list, we have gathered them all together and given all of them the signal "B^{M1}" so that they can be more easily found, and we have arranged them alphabetically within this signal group. Now in cases where stocks are given a signal, the alphabetic arrangement of these stocks in the list as a whole follows the spelling of the signal rather than of the genetic formula itself, inasmuch as it is the signal which a person would first look for in trying to find the stock. We find that this arrangement is much more convenient than the old one, although we have not yet used it as extensively as it probably should be used in our own list.

Finally, in making up our present stock list, we have not adhered as rigorously as before to the classification of stocks into pure first, Y, second, third, and fourth chromosomes, then multiples of each type, etc. Although still using this classification in a general way, we have, for example, classed with the second-chromosome stocks those which involve some gene or even translocation connected with some other chromosome, in cases where the stock was being kept primarily for its second-chromosome content; as when, for example, the inversion-translocation combination termed "Indp" or "IndpT23" was being used as a balancer, even though there is a deletion-insertion translocation present here in which a piece has been taken from the second chromosome and inserted into the third. This sort of liberalization of the classification, although it might make the stock list less easy to use for a robot, makes it much easier for an ordinary human being, or even geneticist, to find things that he is looking for.

Muller, H. J. Nomenclature changes adopted in stock list.

A good nomenclature should, of course, always have the utmost brevity consistent with ready understandability and clarity. This is particularly important in genetic formulae when they become complicated. With this in mind, we have adopted a number of minor improvements in nomenclature in our present stock list. Some of these will be apparent and understandable, without comment here, when the stock list is read, but others call for some comment. In designating an inversion or translocation we no longer enclose the letters which name that rearrangement in parentheses following the symbol In or T, respectively, but show them immediately after those symbols without a space between as well as without parentheses. In the case of a translocation, the chromosome numbers, shown by X, Y or Arabic numerals, and without spacing between them and between the T and the numbers, are used, and are followed by the further specification of the translocation, also without spacing or parentheses. In the case of an inversion, the number of the chromosome in which the inversion occurs is not given either in parentheses or otherwise when it is obvious from the formula in what chromosome the inversion is--as, for example, when it follows or precedes the symbol of a known gene in that chromosome. Now in the case of an inversion like the inversion associated with scute 8, in which a given gene that is symbolized is regularly associated with the given inversion, we do not, as some authors have in the past, first, give the symbol of the gene and then write In and then in parentheses the symbol of the gene again, used this time to designate the inversion with which it is associated. Instead of this, we merely show the symbol of the gene or genetic combination, such as sc^8, and then follow this by a comma, which is in turn followed by the symbol In. Here, the comma is used to signify that the inversion symbolized after the comma is regularly connected with the gene symbolized before the comma; thus there is no need to write the symbol for the gene a second time. The same system is used in the case of a translocation when that translocation is regularly connected with a given gene, as in the case of that connected with scute 2, which would be symbolized in full as follows: sc^2, TX2. When, however, it may be presumed to be well known to the reader that a given inversion or translocation is regularly connected with a given gene which is symbolized, we have often omitted the sign for inversion or translocation, as the case may be, in the interests of brevity and readability.

Thus, for example, we have seldom inserted the symbols for inversion connected with the symbol for the gene Curly, taking it for granted that those inversions are present. When, however, Curly is present only with the inversion of the left arm of the second chromosome, then we have specifically designated this inversion, using the symbol InCyL; and the presence of this symbol in a formula without the corresponding one for the inversion in the right arm would let the reader know that this inversion alone was present in the second chromosome along with the gene for Curly in the given case. We have further departed from formalism in the case of combinations resulting from crossing over between two inversions--for example, inversions associated with some scute effect--by starting the formula for the chromosome (or the part in question) with the symbol of the gene ordinarily associated with the inversion whose left end is present and ending the formula for the chromosome(or part) with the designation of the gene ordinarily associated with the inversion whose right end is present, even though that gene itself may not be present, as in the combination sc^{S1} sc^{4}. Here, it will be realized by those who understand the structure of scute inversions, the right end of the $scute^{4}$ inversion is present but not the gene $scute^{4}$ itself, even though that appears to be represented in the formula. This will not, however, cause confusion on the part of those who understand the matter, and few but those will need to know the meaning of the symbol.

As before, we use a period to designate attachment between parts which in the normal individual are not attached, when it seems helpful to designate such attachment at all. Of course, in the showing of ordinary mutual translocations the attachments are not represented. In cases where there are two points of attachment between a given part that is represented and another part, which is represented by a preceding symbol or by the symbol of genes contained in it, we use as before a colon instead of a period. In addition to using a comma in the way described in the preceding paragraph, we use it also in the following connection. When there are genes or genetic arrangements to be shown in regions of the chromatin which ordinarily occupy two different chromosomes, such as the second and third, but which in the present instance are somehow connected with one another, as by a translocation, we show the contents of the chromatin derived from one of the original chromosomes first, using the usual symbols for the contained genes, inversions, etc., and then insert a comma, after which we put in the symbols for the genes in that portion of chromatin derived originally from the other chromosome. Suppose, for example, we had a translocation between the second and third chromosomes, and one of these chromosomes contained the genes of the so-called "apl" combination, while the other contained the genes of the so-called "rucuca" combination. We would then show first the symbol T23 and the designation of the translocation, all without spaces, then a space, then the symbols of the genes of the "apl" combination, then a comma, and then, without a space after the comma, the symbols of the genes of the "rucuca" combination, This matter is gone into detail here because in the given translocation there would really be a rearrangement of genes and if one wished to show them literally arranged in the form in which they existed in the given chromatin, one would have to rearrange the genes entirely and thus make the formula very different from the ordinary one and correspondingly hard for the reader to follow. Moreover, since the new arrangement would often be unknown, it might not be possible to show it properly. The present symbolism avoids this difficulty. We do, however, show the genes in their proper arrangement in cases of inversions where that arrangement is known. A further item of our symbolism, which should perhaps be recalled here also, is that we use an equals mark (=) after a period to designate that there is another chromosome containing genes just like those already shown and that this chromosome is attached to the other one, as in the case of attached X's, which form the only class of cases for which this symbolism is so far used. We should also mention that, in cases where there is no knowledge to the contrary and the symbol "In" following a comma is placed after a given gene symbol, it is implied that there is reason to believe that the character effect associated with the gene symbol has been produced by a position effect of the inversion noted. When the small letter "h" directly follows, without spacing, the symbol "In" it is further indicated that, while one of the breaks of the given inversion lies close to the gene designated by the symbol, the other break lies in the heterochromatic region. So, for example, the full symbol for the genotype of mottled 4 would be w^{m4}, Inh.

The present nomenclature of alleles, in which the date of discovery is used in the superscript, is in general an unsatisfactory one because it is far too long. We stated, in a note sent in to the DIS in which the nomenclature of alleles was originally taken up, that such a symbolism would require an abbreviation of the abbreviation; but through some error this remark of ours was not included, and therefore we restate it here. Nevertheless, we have still followed this usage in some cases, although we intend to shorten our symbols of such alleles eventually.

In designating either inversions or translocations or other rearrangements, the ideal scheme would, of course, be, except in cases of very well-known ones that can be shown by a simple symbol and will then be widely understood, to give the locus of at least the more important break in the chromosome, either by the symbol of a known gene very close to the break or by the designation of the position of the break in the salivary chromosome as mapped by Bridges. This is particularly desirable when for any reason the translocations or inversions are being used primarily because they have the break in the specific position which it occupies. We have a number of these translocations, involving chromosomes X and 4, as shown in another article, and in these cases the position of the break in the X is known and the translocation has been designated according to this position. The scheme then is for the symbol to begin "TX" and then to state in parentheses the approximate point at which the break in the X occurs as shown in Bridges' map, and after the parenthesis to designate the other chromosome involved, in this case 4. Here, unlike the cases previously mentioned, a parenthesis is desirable so that the letters and numbers within will not be confused with those outside the parenthesis and will be understood to refer to the salivary map position. We have thus designated not only our own recently obtained translocations between X and 4 in this way, but also those from other sources which we have in our laboratory and whose positions of breakage in the X happen to be known, and we have arranged them in our stock list in order of the position of the break in the X, beginning at the left end.

Wallace, Bruce. A new proposal for the control of mites.

Prompted by the success of the U. S. Army in its use of benzyl benzoate as a chigger preventive, we have made preliminary tests of the effects of this substance on "white" mites and D. pseudoobscura. Benzyl benzoate is an oily substance (boiling point, 323° C.) which is soluble in alcohol and insoluble in water. Water suspension can be made by adding water to alcohol solutions or, less successfully, by the use of soap. Mites placed on paper toweling treated with 2%-4% benzoate-alcohol solution from which the alcohol has evaporated die in three to five minutes. Adult D. pseudoobscura walk and rest on such toweling in culture bottles with impunity. Toweling treated with 8% solution, however, seems to be injurious to the flies. Developing larvae crawl onto treated paper to pupate and emerge as imagoes without harm. One cc. of 5% benzoate-alcohol solution was poured over and worked into the food of a culture bottle. A small peice of food containing developing larvae was placed in this treated culture. Larvae made their way into the untouched portions in the bottom of the culture and later emerged to pupate. Population-cage experiments, which are invariably ruined by mite infections (see Wright and Dobzhansky, Genetics 31: 127, 1946), apparently can be saved by the use of benzyl benzoate. Two methods have been tried to date. In the first, the infected cage was generously sprayed (Holmspray atomizer, 98 cents) inside and out with a 2% alcoholic solution. Cups were wiped and food surfaces were sprayed with the same solution. Adults were drowned by the spraying, but larvae within the food survived and have now emerged from pupae as flies. The second method consists of merely transferring cups from the infected cage to a new one after careful wiping and spraying of the food surface. No mites have reoccurred in cages treated by these methods. Cages are now sprayed periodically in an attempt to prevent mite infections. All vulnerable exterior cracks, crevices, corks, plugs, and such are sprayed lightly every two weeks. We hesitate to recommend this treatment without reservation because of the small amount of experimentation we have done with it. However, our preliminary results seem to justify our recommendation that benzyl benzoate be used experimentally on other types of mites and other species of Drosophila. It was through the kind suggestion of Dr. H. T. Spieth of Columbia University that our attention was called to the use of benzyl benzoate. Dr. Charles Michener of the American Museum of Natural History supplied information about the concentrations most likely to be effective.

Research Notes

Barigozzi, C. Report of research at the Zoological Institute, University of Parma. During 1947, research on Drosophila was carried on in two main directions: (a) genetical analysis of the reaction of the flies to light, and (b) detection of Y-chromosome effect on quantitative characters. (a) The light reaction was studied in *D. melanogaster* and *D. pseudoobscura* with the technique already used for a previous investigation (see Barigozzi, C. and Tonissi, G., Zool. Inst., Univ. of Milano). It was found that wild stocks differ in degree of phototropism and that *D. pseudoobscura* shows very different behavior. In this latter species selection for phototropism and photophoby has been carried out for six generations to date. In the case of photophoby a variation in the stock was found, proving that the stock was originally heterozygous for the genes responsible for the light reaction. This research is still in progress. (b) The role played by the genome in determining cell size was studied in *D. melanogaster.* This investigation will appear in the "Rendiconti dell 'Istituto Lombardo di Scienze e Lettere, Class Scienze," probably in 1948. It was shown that the size of the cells of the wing surface, measured as frequency of unicellular hairs. depends on the genes and that there is a maternal effect. In a further step it was proved, making the studied stocks (two wild stocks from Italy) isogenic for X and autosomes, that the Y chromosome influences cell size both in the wing and in the eye corneolae. This investigation was communicated to the VIIth Congress for Exp. Cytology in Stockholm.

Bertani; G. Action of mutagenic substances. Adult males (Oregon stock) injected with phenol, at the most effective concentration used by Hadorn and Niggli, have been tested for lethals (ClB method). Chromos. tested, 1954: lethals, 4; % lethals, 0.20 ± 0.10. Controls: chromos. tested, 546; lethals, 1; % lethals, 0.18 ± 0.18. It must be concluded that injection into adult males is an ineffective method of introducing mutagenic substances. Negative results were obtained also in tests of the progeny of males treated during larval life with methylene blue (dissolved in the food at a concentration of 0.001%) and of other males treated with a vaporized solution of 0.05 M KJ for about 40 hours.

Bertani;, G. (2) Diapause in *Drosophila nitens*. *D. nitens* undergoes winter diapause at the adult stage, also under constant conditions of temperature and lighting. Selection of individuals homozygous for a newly occurred recessive character (occhi rossi), made on adults entering diapause, has been 100% effective. This shows that at the beginning of diapause the adults have not reached mating ability (or, alternatively, that sperms in females are reabsorbed). A temperature shock may "break" the diapause (see Bibliography). After this treatment our stocks reproduced uninterruptedly for nine generations.

Bertani, G. (3) Frequency of abnormal spermathecae in *Drosophila melanogaster*. The frequency of females with abnormal spermathecae (three or four spermathecae with single or subdivided ducts) has been studied in some wild melanogaster stocks:

Stock	No. normal females	No. abnormal females	% abnormal
Oregon	2759	56	1.99 ± 0.26
Tavira	1510	0	0
U. Kulm Aargau	588	1	0.17 ± 0.18
Barce	469	0	0
Dauro	551	2	0.36 ± 0.25
Salsomaggiore	364	1	0.27 ± 0.27

Some differences between stocks are significant. The Oregon stock, which has been studied most, shows variations in time, as to the frequency of abnormal females. This may depend on slight changes in environment or on random changes in the genetic basis of the character, which must be considered of a polygenic nature (see Mather's correlated responses to the selection). The behavior of the character in crosses of different wild strains is now under study.

Bertani, G. (4) Method of searching for visible mutants present in natural populations. A backcross method (wild male x laboratory virgin female; a number of F_1 virgin females x the same P male; progeny of each F_1 female bred in single cultures) is more useful than the usual inbreeding method in the search for visible mutants heterozygous in wild individuals. By the suggested method, 7 F_2 (backcross) cultures are necessary if all ($P > 0.99$) heterozygous mutations must be revealed in the segregation; the inbreeding method (Buzzati, Ricerca Sci. 13: 448, 1942) requires 16 F_2 cultures for the same probability level. The only disturbing factor is the introduction into the crosses of a non-wild genotype (that of the P laboratory virgin female). On the other hand, this method allows greater precision in calculating gene frequency in natural populations than does inbreeding from wild females, which usually have already mated with a number of unknown wild males before being collected.

Bird, M. J. Additional notes on the X chromosome of *Drosophila subobscura*. New genes: Four new genes have arisen spontaneously, on the X chromosome, and have been located. *burnt* is phenotypically similar to *singed* but not allelomorphic with it. *rimy* (white hairs between the ommatidia and a crumpled wing effect) and a lehtal 1(1)47d are both located between *plum* and *cut*; and have lengthened the chromosome map, which now is as follows: 0 *miniature*; 10.9 *plum*; 18.5 *rimy*; 30± *l(1)47d*; 44.2 *cut*; 48.7 *burnt*, etc. *Beadex*, which is probably homologous with *Beadex* in *D. melanogaster* is 0.23 units from *vermilion*.

Further investigations of the testes abnormalities in crossveinless[2] suggest that they are due to rather small changes in the genital anlage. A time factor is probably involved, as in one set of experiments 16% more abnormals were found in the late-hatching males. Outcrosses indicate that different laboratory stocks contain enhancers and partial suppressors of the genital abnormality, without altering the wing effect. Within the inbred stok the frequency of genital abnormality in uncles and nephews was also correlated. On the other hand neither the expression nor penetrance of the wing effect was variable.

roughener. When *Notch* ♀s are crossed with certain + ♂s their Notch progeny have large, bulging, and very rough eyes. The facets are disarranged and brown pigment is distributed to form irregular dark and light patches. Six of 12 laboratory stocks tested carried the roughener, 5 did not, while one segregated for it.

All surviving sons and all normal daughters of rough-eyed Notch ♀s carry roughener; as it does not cross over with Notch it appears to be a gene at a locus in or very near the Notch deficiency. It has no visible effect when hemizygous or homozygous, but is made visible by exaggeration in presence of Notch.

Demerec, M. Chemical induction of mutations in Drosophila by the aerosol method.

Using a suitable nebulizer it is possible to produce a fine aerosol having a particle size of diameter 1.5 microns or less

It has been found that mutationsare induced in the sperm of Drosophila males if the flies are kept in an atmosphere containing aerosols of certain chemicals. In our experiments the following set-up is used for treatment. The aerosol is generated, from either a water or an oil solution of the desired chemical, in a De Vilbies-40 glass nebulizer by an air flow of 6 liters per minute, produced by an electric air pump. The aerosol is piped through plastic tubing into a half-pint milk bottle, where the large droplets occasionally thrown out by the nebulizer are retained. From this bottle the aerosol is piped into a similar bottle containing fly food and the flies to be treated. Excess aerosol is discharged into the exhaust. Aerosol generation is started by turning on the pump. Treatments are usually of long duration--up to 200 hours or longer, depending on the toxicity of the chemical used. As a rule, flies are kept in the same bottle throughout treatment, but the bottle is changed if it becomes too moist or sticky. The aerosol is generated periodically, every 30 minutes for 30 seconds. Since this is regulated by an electric time switch, treatment can be carried on without any attention except for occasional examination of the flies to make certain that they are surviving the treatment. By means of this sytem, flies are kept in an atmosphere containing an aerosol of a chemical solution, and this atmosphere is renewed every 30 minutes.

Tests have been made for X-chromosome lethals and for translocations. The following chemicals gave significant increases in the numbers of lethals: methyl-*bis*(betachloroethyl)amine, 1,2,5,6-dibenzanthracene, 20-methylcholanthrene, 3,4-benzpyrene, p-hydroxyazobenze, p-aminoazobenzene, sodium desoxycholate, and acriflavin. The following showed no increase; phenanthrene, pyrene, alpha-naphthylamine, azoxybenzene, p-diethylamino-azobenzene, p-dimethylamino-azobenzene, 2-amino-5-azotoluene, and acetylaminofluorene. The chemicals underlined with a solid line are carcinogenic, and those underlined with a broken line did not show carcinogenicity in tests made with them. Considering the important role played by biological factors in the expression of both mutagenicity and carcinogenicity, and considering the biological differences between the materials in which these two effects were studied (Drosophila and mammals), the observed correlation between the two effects appears to be quite striking. From this correlation it seems unavoidable to infer a common causative relation. This inference is further strengthened by the behavior of all known nonchemical carcinogens, such as X-rays and related radiations, ultraviolet rays, and heat, all of which are mutagenic. The most obvious and most probable relation between mutagenicity and carcinogenicity is the one suggested by the hypothesis that cancer may originate through a gene mutation occurring in a somatic cell.

Fox, Allen S. Mutation of bt^D During the use of a Cold Spring Harbor stock of bt^D/ci^D, it was observed that in no cross which should have produced the heterozygote bt^D/+ was any visible effect of bt^D apparent. The following series of matings was made (at room temperature) to test these observations further:

4 reciprocal matings (bt^D/ci^D x +)

	+		ci	
	♂	♀	♂	♀
F_1	153	198	177	163
	351		340	

Backcross F_1 + x + \$ (1 mating)

+		ci	
♂	♀	♂	♀
59	72	0	0
131		0	

Backcross F_1 ci x + \$ (4 matings)

+		ci	
♂	♀	♂	♀
73	102	96	79
175		175	

F_2 ci x ci (1 mating)

+		ci	
♂	♀	♂	♀
22	22	43	42
44		85	

To test the possibility that the temperature was responsible for the absence of visible effects of bt^D, the following matings were made:

(At 18°) 4 reciprocal matings (bt^D/ci^{D}x +)

	+		ci	
F_1	♂	♀	♂	♀
	70	68	67	93
	138		160	

(At 30°)

4 reciprocal matings (bt^D/ci^D x +)

	+		ci	
F_1	♂	♀	♂	♀
	35	39	36	33
	74		69	

Since the Cold Spring Harbor stock remains balanced, the most plausible explanation is that the gene bt^D had mutated, losing its visible effects. The recessive lethal effect, whether due to this same gene or a closely linked one, is retained. The genotype of the stock is, therefore, ci^D/l(4). The results of numerous crosses using the Pasadena stock of bt^D/ci^D indicate that this stock is probably identical with that of Cold Spring Harbor.

Fox, Allen S. (2) Derivation and description of isogenic stock. Chicago stocks Nos. 72 and 73 were derived by the following series of crosses:

sc lz/ClB ♀ x Cy-RNS/Pm^2; Sb/Payne Dfd ca ♂

F$_1$ +/ClB; +/Cy-RNS; +/Payne Dfd ca; +/+♀ x own father
+/+; Cy-RNS/Pm^2; SB/Payne Dfd ca; +/+
+/Y; Cy-RNS/Pm^2; SB/Payne Dfd ca; +/+ } $ No. 72

+/+; +/Cy-RNS; +/Payne Dfd ca; +/+ mating brother and sister
+/Y; +/Cy-RNS; +/Payne Dfd ca; +/+
+/+; +/+; +/Payne Dfd ca; +/+
+/Y; +/+; +/Payne Dfd ca; +/+ } $ No. 73

By means of this series of crosses, all chromosomes except the 4th trace to a single source. Barring crossing over in F$_1$ ♀ and the occurrence of spontaneous mutations, stock 73 is isogenic in chromosomes 1 and 2, and stock 72 carries the same first chromosome as the former. Since stock 73 remains balanced, its third-chromosome genotype is Payne Dfd ca/l(3)F, as listed. To date this stock has been maintained through 6 generations of brother-sister matings, thus reducing the chances of heterozygosis in chromosome 4. Viability of both stocks is excellent.

Gowen, John W., and Stadler, Janice In recent inbreeding experiments we have uncovered a genetic situation similar to that reported by Dr. Redfield some years ago. The females carrying this condition show a large excess of males in their progeny. This condition appears to be partially recessive and probably confined to the second chromosome. It is not sure that it is a single gene.

Hinton, Taylor and Dibble, F. Negative evidence on reverse mutations. y ct^6 ras^2 v f flies were irradiated with 3000 r of X-rays in an effort to obtain reverse mutations of the recessive genes. 6259 offspring were examined and no reverse mutations were found.

Lamy, R. Two small X-chromosomes deficiencies were found among spontaneous lethals. One occurred in a scar male and was carried by 9 out of 146 of his tested daughters. Salivary studies by Dr. Slizynski showed approximately 4 bands to be missing, including the cut locus. (Stock list, No. 61). The second deficiency occurred in a female and was observed in one out of 143 of her tested daughters. The chromosome involved was the sc^{S1}InS ct w^a sc^8, and the deficiency covers yellow. Salivary studies not yet completed. Now balanced against y w loz (Stock list, No. 62).

Milani, R.. Lethality in so stock. Research on lethality in so stock has proved that death of lethal pupae is due to malformation of femurs, which are found folded and contracted. This malformation is nearly always limited to the legs of the first pair. Affected pupae are unable to hatch. Experimentally disengaged, they will briskly waver their legs, yet they cannot walk. They can creep for a few centimeters.

Lethality, according to research still going on, has been found to be independent of the so factor, but subject to the action of complementary or modifying factors. In fact, individuals have been obtained from pairing with other stocks, wild and mutant, both so and with developed eyes, who are able to hatch but unable to walk on the culture ground, or able to pull out from the puparium with their heads and part of the thorax (first pair of legs) only. In two different crosses I have found two headless individuals--extracted from the puparium while still living--with their chitin already melanic. Cephalic parts were inside the thorax, which was imperfectly chitinized. One of these was dissected and found to have spherical testes and ripe sperms.

Milani, R. (2) Wasp parasites of Drosophila, and the possibility of utilizing them for genetical research. At the end of June, this year, I observed some little parasite wasps breeding upon Drosophila pupae in an open container exposed at a window of my laboratory. They seem to correspond to Pachineuron vindemmiae, briefly described by G. Martelli in 1909 (Boll. Lab. Zool. di Portici, Vol. 4, p. 169). All pupae collected (about 200) were found infected. I began breeding with wild ♀ and individuals hatched from infected pupae. Breeding is successful both in glass cases--in the presence of Drosophila free to reproduce in open containers--and in the containers commonly used for Drosophila (vials and bottles) with some small drops of water and diluted honey on their walls. Pupae to be infected are then introduced therein. Old Drosophila cultures are not suitable for breeding, because wasps will stick eventually to the walls. However, I have obtained under these conditions several F_1 individuals. The average life span is 18 days at 25° C.

Isolated females or pairs seem to live longer than individuals in mass cultures. Females kept in isolation have lived about one month, sometimes reaching an age of 50 days. They can lay up to 30-40 eggs daily. Unmated females are as fertile as mated ones and will give numerous haploid male offspring.

Mutability or heterozygosis must be very low, since I have observed no mutants on about a thousand individuals examined (I considered only the following characters: shape and color of body, wings, antennae, eyes, and legs). Variable characters were only body size (1 to 2 mm.) and leg color (ranging from bright yellow to dark brown, through all intermediate shades). The first of these two characters (perhaps the second also, but it is difficult to find a method of evaluating color degrees) is much influenced by development conditions of the larvae. Larger individuals are generally obtained from large pupae of funebris, similis, and immigrans than from melanogaster. Very small individuals are obtained from pupae exposed for a long time to the wasps' stinging. Under these conditions a high percentage of host pupae will die, without parasite larvae being able to develop.

These wasps, easy to breed, may become a good material for genetical research, especially if cytological analysis, which has not yet been attempted, should reveal a limited number of chromosomes.

Moree, Ray Reversion and elimination of Bar eye. A few wild-type flies appeared in an old culture of a B stock. After the stock was recultured, the reverted wild-type flies replaced and finally eliminated the entire B stock. It is known that the productivity of B is less than that of wild-type; in the present case the reverted wild-type stock had a productivity greater than that of B but less than that of other regular wild-type stocks, as could be determined by simultaneous culturing of corresponding numbers of both kinds of flies. The reason for this hasn't been determined (inexact reversion?). As concerns elimination, the case parallels the elimination of y females by detached w^e females (DIS-20, p.88)

Peterson, Peter A. A sex-linked character expressed as ether-sensitive (es). In the course of chemical-aerosol treatments of D. melanogaster Ore-R males with acriflavine (see research note of M. Demerec), a sex-linked semilethal was picked up (47i). The semilethal wild-type males from the cross $+/sc^8\ w^a\ B$ x $sc^8\ w^a\ B$ (the + coming from the treated male) were characterized by extreme sensitivity to ether. After normal exposure to ether these + males showed the fatal symptoms of overetherization--i.e., wings folded back and abdomen at an acute angle. All other flies of the cross--namely, $+/sc^8\ w^a\ B$ and $sc^8\ w^a\ B/sc^8\ w^a\ B$ females, and $sc^8\ w^a\ B$ males-- were normally etherized.

This ether-sensitive wild-type male had a very poor viability and was not so husky as the normal wild-type males. All efforts to mate it with $+/sc^8\ w^a\ B$ resulted in failure, owing to its short life. Nevertheless, four homozygous wild-type females were found in stock bottles. These showed the same reactions to ether as the wild-type males--i.e., folded wings and abdomen at an acute angle. Most of the wild-type males and females observed were relatively newly hatched as compared to the non-wild-type flies; this may be taken as evidence of their inviable nature. Out of the total number of males, only 21% were wild-type.

The location on the chromosome is either 5 or 3 units to the left of echinus--that is, between .5 and 2.5. The position could not be determined more exactly because of low numbers and several doubtful cases.

Poulson, D. F. The pole cells of D. melanogaster. Sonnenblick (1941) and Aboim (1945) have shown that only a part of the original large number of pole cells actually reaches the lateral mesoderm and becomes incorporated in the gonad as germ cells. In a detailed study of the embryology of D. melanogaster it has been found that the pole cells which do not reach the gonad remain associated with the posterior rudiment of the mid-gut and subsequently are incorporated as a mid section of the mid-gut. This later becomes the acid section of large mid-gut cells described by Marie Strasburger in her account of the larval gut. In other Diptera this section has been shown to lack proteolytic enzymes. In view of these findings it is necessary to revise previous ideas of the pole cells as completely predetermined germ cells and of the posterior polar plasm as a germ-cell-determining region of the egg.

Poulson, D. F. (2) Iron-accumulating cells in the larval gut of Drosophila species. Using the technique of Waterhouse, who has studied metal-accumulating cells in the larval gut of blowflies, observations have been made on ferric iron distribution in the mid-guts of four species of Drosophila (melanogaster, funebris, pseudoobscura, and gibberosa). In each species (all raised on the same medium without added iron) the iron-accumulating cells are readily demonstrated by the production of prussian blue on exposure to a solution of potassium ferricyanide in dilute HCl. The pattern of distribution of the iron-accumulating cells is different in each of the species studied, sufficiently so that these species can be distinguished on this basis. The observations are now being extended to a considerable series of species, to see how far differences can be established within species groups in the several subgenera.

Suley, A. C. E. Transplantion of eye rudiments between *Drosophila subobscura* and *D. melanogaster*.

Scarlet, poppy, and cherry implants from *Drosophila subobscura* have previously all appeared to develop autonomously in *D. melanogaster* wild-type hosts. As this implies that none is homologous with cinnabar *D. melanogaster*, the work was repeated using double recessives with maroon. ma and ch ma developed autonomously. The color of pp ma implants however was not autonomous, though paler than ma. pp might therefore correspond to cn or bri *D. melanogaster*. pp ma implants to cn and bw on *D. melanogaster* are autonomous and have no effect on the bw cn host eye. pp is therefore more probably homologous with cinnabar. Implants from s *D. subobscura* cause slight formation of brown pigment in bw v D. melanogaster host eyes. Here it resembles st rather than cd *D. melanogaster*, but the effect is less strong than that of st implants, though certainly not a starvation effect. Implants to bw v hosts from other red-eyed *D. subobscura* mutants are not yet available.

Waddington, C. H. Regulation in bithorax "hemi-thorax."

In a stock of bithorax, a fair proportion of flies (some 2-3%) were "hemithorax" owing to the failure of the mesothoracic disc to evert. In these, the body-parts derived from the metathoracic disc had shifted forwards into the space normally occupied by the mesothoracic derivatives, and were usually larger and better developed than those on the nondisplaced side. In a few cases, the metathoracic derivative on the "hemi-thorax" side had fused laterally with the mesothoracic derivative on the normal side, and had developed into a region much more similar to the missing part of the mesothorax than to the usual bithorax metathoracic derivative. This regulation towards normality presumably takes place after, and as a consequence of, the eversion of the thoracic discs.

University of British Columbia Report on research.

Investigation of a new mutation "Synpalpi" in which the upper portions of the antennae are fused. Viability poor. Produced by a chromosomal aberration, probably a deficiency in the terminal bands of the X chromosome. Locus undetermined.

Technical Notes

Callan, H. G. Collection of dechorionated Drosophila eggs.

Hill (DIS-19, p. 62) has made use of sodium hypochlorite solutions for removing the chorion from Drosophila eggs. We have found that a degree of mechanical agitation is also required if Hill's method is to be successfully adopted. Eggs are laid on agar-plated watch glasses. After laying, eggs and agar are roughly scraped off with a scalpel and placed in a 3% (or slightly stronger) solution of sodium hypochlorite contained in a centrifuge tube. The contents of the tube are shaken and left to stand for two or three minutes. They are then violently shaken once more and centrifuged for a few seconds in a hand centrifuge. The dechorionated eggs come to the surface of the liquid and can be readily removed with a sectionlifter. 100% of the eggs originally present can be recovered if the shaking and centrifuging are repeated two or three times. Such eggs develop normally if washed subsequently in tap water.

Crow, James F. Preventing the spread of mites.

A mixture of roughly equal parts of mineral oil and benzyl benzoate has been used very successfully. This is applied with a small brush in a ring around the top of the container (just under the lip in the case of milk bottles) and remains in a condition to trap and kill mites for several weeks.

Hsu, T. C. A rapid method of making permanent mounts for smear preparations.

In making a permanent mount for a smear preparation, the trouble in the past has been loss of the material in the course of separating the cover slip from the slide. We have now developed a new technique, which does not require the removal of the cover slip. Instead of using 95% alcohol, we put the slide carrying the temporary smear preparation, either sealed with wax, or unsealed, into a copling jar containing a mexture of xylol and absolute alcohol in equal parts plus a few drops of glacial acetic acid. After the sealing wax is dissolved, in the case of the sealed mounts, we apply very dilute balsam drop by drop on the edge of the cover slip, allowing it to diffuse into the material gradually. Preparation of permanent mounts in this way not only prevents shrinkage and loss of the aceto-carmine smear but also saves the trouble of separating the cover slip from the slide. The preparations look as good as fresh ones.

Hsu, T. C. (2) An improved method for salivary-gland smear preparations.

In the ordinary aceto-carmine smear preparations for salivary-gland chromosomes, the differentiation of chromosomes is often obscured by the stained cytoplasm. An improved method, which is aimed to render the cytoplasm colorless in contrast to the stained chromosome, consists of the pretreatment of the gland in 1/N hydrochloric acid for about 10 minutes at room temperature. The glands must be completely submerged in the acid, however, for otherwise the chromosomes would undergo disintegration. After being taken out of the acid and before being put into the aceto-carmine solution, the glands should be placed on a piece of blotting paper for a while in order to remove the excessive HCl. Usually one to two minutes in the aceto-carmine solution is sufficient to effect a good preparation. This has been found so successful that almost every such preparation gives excellent well-stained chromosomes against colorless cytoplasm. Furthermore, the glands can be more easily squashed than those untreated with HCl.

Mittler, Sidney The amount of propionic acid necessary to inhibit mold growth.

It has been shown recently that the inhibition of mold growth depends on concentration of at least .012 M of the undissociated fraction of propionic acid (Olson & Macy, J. of Dairy Science 29: 173-180, 1946). Since the undissociated portion = $\frac{H}{H + K}$ at a pH of 7, the undissociated fraction = $\frac{1 \times 10^{-7}}{1 \times 10^{-7} \times 1.4 \times 10^{-5}} = .0071$, pH 6 = .067, pH 5 = .415, pH 4 = .875. Hence at lower pH values less propionic acid need be added to the food mixture to obtain the necessary amount of undissociated propionic acid. At a pH of 5, only 2.1 cc. of propionic acid is required per liter, while at a pH of 6, 13.2 cc. is needed to give .012 M of undissociated propionic acid. In our laboratory we have had excellent results in using propionic acid to inhibit mold growth in a cracked wheat-agar mixture (pH 6). Since the proteins in food mixture act as a buffer, it is recommended that pH be taken just after boiling the food mixture and then stirring in the necessary amount of propionic acid. A concentration of .04 M undissociated propionic acid was found not to be harmful to D. melanogaster and D. macrospina.

Mittler, Sidney and Bartha, A. Brilliant cresyl blue as a stain for salivary chromosomes.

Excellent results have been obtained by staining the salivary chromosomes of Drosophila with a mixture of three parts 3/4% brilliant cresyl blue in 45% acetic acid and 1 part of 1% toluidine blue in 45% acetic acid. The excess of stain is washed out of the whole gland with 45 % acetic acid after 1/2 hour, and then the nuclei are broken. We find that this stain gives a sharper differentiation in the bands than the aceto-carmine method. A blue band on a light-grey background is more distinct than a red band on the same background when viewed through the microscope. Another modification is the use of 2% brilliant cresyl blue in 50% propionic acid. This combination penetrates more rapidly and causes less distortion.

Moree, Ray A convenient label for experimental cultures.

A new design for gummed labels has proved to be time-saving and convenient, especially for class use. The number of the experiment is written on the line after Expt.; description of the cross is written in the space below; the date on which the cross is made is written after Make; the cross is dated to be broken 7 days later, this date being written after Break (+7) (by breaking a cross it is only meant that the parents are removed); date of emergence is noted after Emerg.; the culture is dated to be discarded 8 days later, this date being written after Disc. (+8). The labels measure about 60 mm. x 20 mm.

Expt. ____________ Make: ____________
Break(+7): ____________
Emerg.: ____________
Disc.(+8) ____________

Whittinghill, M. A method of recording multi-point linkage testcrosses.

The sample data sheet shown here has proved to be handy for linkage studies. Space and time may be saved by using this form, because all crossovers are recorded on one page, and because the sheet may be quickly prepared. It is usually made on graph paper or other data paper, allowing several lines and columns for each of the squares drawn on the sample checkerboard.

All data may be recorded in a checkerboard having one more square on each side than there are regions of detectable crossing over. Noncrossovers may be scored in the 0-0 square, putting one class in the upper half and the complementary class below. The single crossovers may be recorded on the 0 line under the column numbered for the particular region of exchange. All double crossovers may be entered at the intersections of the columns and lines numbered for the two regions of exchange; hence all doubles occupy a triangular part of the checkerboard, here the lower left. Triple and higher-multiple crossovers may be entered in the remaining large triangle as they are encountered in the family. Each kind should be recorded at the intersection natural for any two of the three or more regions of exchange, provided the designation of all the regions of that crossover be written in the center of the square. Plenty of spaces are available for those few kinds of multiple crossovers which are apt to be found in any one culture or small family.

The division of each square into halves for each of the complementary classes of crossovers is essential; but still other subdivisions can denote the date of classifying, horizontally, and even successive subcultures from top to bottom within the large square set aside for each class of offspring. It is not too difficult to make entries in the proper places with a little concentration and a definite system of sorting specimens. Dates of classifying may be written in part of a spare square (or below in the sample table) in the position corresponding to the location of that day's counts throughout the table.

The sample table shows, for example, that 1 rucuca and 13 wild noncrossovers were obtained in the first day's count, Sept. 29, when 61 Moire' flies were discarded; that the single crossovers for region 4 were 2 ru h th st flies on the third day of counting and 1 cu sr e ca fly in the second count; that 4 h th st cu sr e flies were double crossovers in regions 1 and 7; that 1 triple crossover for regions 1-5-7 of constitution ru sr e was found; and that 1 th st sr e fly was a quadruple crossover in regions 2-4-5-7. Reference is made to the linkage map of the heterozygote given at the top of the page. No complements appeared in some cases, as shown by the empty halves of those boxes marked for multiple crossovers.

Aside from simplicity of preparation and ease of use this data sheet makes it possible to check quickly on all exchanges in a particular region of the chromosome regardless of how crossing over may be involved in single, double, and multiple exchanges. Such record forms are about to be used again in a search for oögonial crossing over.

Sample Data Sheet for Recording Crossovers

Testcross 2 ru h th st cu sr e ca by 3 rucuca/Mé
1 2 3 4 5 6 7

Regions:	0	1	2	3	4	5	6	7
0	1,1,4,1 13,4,3,2,	1,2,2,1 2,	3, 1,1 3,1	Singles	2 1,	2,1,1,1	1,1,2,1	2, 1,2 3,5,2,3
1			1-2-7 1,		1-4-5-7 1,	1, 1-5-7		
2			O		2-4-5-7 1,			
3	D o			t				
4	u b	1,	1,		h			
5	l e		2,			e	1, 2-5-6	
6	s	2,	1,		1,		r	
7		1, 2 3, 1,	2, 1, 2,		1 2,			s

Legend: Above, ru class; below, non-ru class; left to right, date classified.

S.	Oct.
29	1,3,5
61,62,46,39	

Moire' (discarded)

Research Notes

Barigozzi, C. Report of research at the Zoological Institute of the University of Milan.

This year some investigations on Drosophi have been carried on. Barigozzi and Dr. Semenza began a series of cultures in boxes of D. melanogaster for the study of competition between isogenic stocks, different for one locus. The work is in progress. A new Notch was discovered, where both hemizygous and homozygous conditions are viable. Only the sex ratio shows that the males are more numerous than the females (♂♂ 128.8 : ♀♀ 100.0). Apparently the N/N condition is less viable than N/Y. No deficiency present. Salivary chromosomes normal. Barigozzi went on collecting data on the influence exerted by the Y chromosome on cell size in D. melanogaster (publ. Nature 162: 35, 1948). Miss M. G. Castiglioni (unpublished data) began systematically to transplant imaginal disks of the eye in D. melanogaster in order to determine the action of internal environment of the size of the facets. This work is still in progress.

Buzzati-Traverso, A. D. bifasciata, a systematic note.

In Pomini's description of five species belonging to the "obscura group" (see DIS 14: 63), a systematic account of the new species. D. bilineata is given. This name is used by Pomini throughout the pape but in the determination key (p. 163) the same fly is referred to as D. bifasciata. Since the name bilineata has been previously used by Williston for a quite different species (see Sturtevant's North American Species of Drosophila the species described by Pomini and belonging to the European "obscura group" should be named D. bifasciata Pom.

Buzzati-Traverso, A.(2) Larvae of D. subobscura found in nature.

In order to improve the breeding techniqu for this species an attempt has been made to obtain data on its natural food. Previous attempts were not successful. During the month of September, 1948, adul individuals of this species as well as of D. phalerata were found congregating on fruits of cornel trees (Cornus sp.) decaying on the soil of mixed woods. A few larvae were to be seen in the fermenting fruit pulp. When put into bottle these larvae eventually matured, and from them were recovered numerous adults of the two species named. Similar results were obtained in Isola Madre, Lago Maggiore, Northern Italy, and in woods 300 kilometers apart, in the neighborhood of Belluno, Dolomites region, Northern Italy.

Buzzati-Traverso, A. (3) Wild yeasts from D. subobscura adults.

With the purpose of obtaining some information about the wild yeasts present in the natural food of D. subobscura, half-pint bottles with a layer of fermented figs were used as baited traps. The bottle's mouth was covered with a double layer of sterilized cheesecloth, in order to prevent the entrance of attracted flies into the bottle, while permitting the outflow of the fermentation scent; the outer walls of the bottle were sterilized with a Bunsen flame. After a few hours' exposure in the wild, subobscura flies were congregating on the bottle's neck and on the cheeseclot Some of these were captured directly by means of tubes with sterlized worth-agar slants; on this culture medium several colonies of yeast developed. Suc yeasts, probably present on the legs and proboscis of the flies, look morphologically alike, even when isolated in fifferent regions of Northern Italy. Studies are under way to test the preference of subobscura for these wild yeasts, as compared with the usual baker's yeast, and to determine them.

Gans, Madeleine A new, sex-limited mutation in D. melanogaster

"Z" (zeste). Spontaneous in Cy/Bl sp^2 stock. Eye color of females lemon-like, of males wild-type. Males can transmit the gene but are always wild-type. Sex-linked, locus at 1±. The absence of manifestation in males is not due to the presence of a normal allele in the Y chromosome.

Gardner, Eldon J. A case of genetically controlled cytoplasmic influence in *Drosophila melanogaster*.

An abnormality expressed as irregular growths on the surface of the head of *D. melanogaster* is being studied at the University of Utah. The trait appeared in a stock at the University of Texas which had been collected from the wild and was received at the University of Utah through the courtesy of Dr. Wilson Stone. The name "tumorous head" has been used to identify the trait and the stock which carried it. The evidence indicates that a substance in the cytoplasm interacts with an autosomal gene in expressing the abnormality. The pattern observed in the results of reciprocal outcrosses was characterized by about 30% abnormal flies in the F_1 when a tumorous-head female was crossed with a male from another stock. Less than 1% of abnormal flies was obtained when a tumorous-head male was crossed with a female from another stock. The F_2 results are comparable for reciprocal crosses, and the percentage of abnormality does not exceed 4% except in the presence of modifiers. These data are interpreted to mean that a cytoplasmic substance interacts with a genetic mechanism in the expression of the trait. Oregon-R females have been shown to carry a cytoplasmic substance comparable to that of the tumorous-head females, but the Oregon stock does not carry the gene with which the cytoplasmic substance interacts to produce the abnormality. F_3, F_4, and F_5 results show evidence of segregation of a recessive sex-lined gene which controls the production of the cytoplasmic substance, and a gene, intermediate in inheritance, with which the cytoplasmic substance interacts. Data from crosses with markers indicate that the gene with which the cytoplasmic substance interacts is in the third chromosome.

Gloor, H. Transplanatation of aristopedia and bithorax.

In search of another character with non-autonomous development, imaginal discs of the middle third larval instar of the two mutants ss^a and bx have been transplanted into normal larvae of similar age, and vice versa. Both ss^a antennal and bx dorsal metathoracic transplants developed their respective mutant characters typically. The transplants also did not disturb the wild-type character of the host.

Gloor, H. (2) Dominant mutant affecting imaginal discs.

From a stock, fes lt/Cy, a mutant has been isolated in which various disturbances in imaginal development take place. The most frequent type of manifestation is unilateral suppression of the ventral or dorsal or both mesothoracic imaginal discs. Less frequent are reduplications of various degrees, and only occasionally are "homoeotic" modifications found. The dominant mutant "Krüppel" (K; 2-113 approx.) overlaps wild-type (penetrance 10% ±). Homozygous lethal.

Hadorn, E. Call for larval and pupal lethals.

Since our laboratory is engaged in the developmental analysis of lethals, I would appreciate it very much if colleagues could send me larval or pupal lethals of Drosophila which they do not intend to analyze themselves.

Hadorn, E., Bertani, G., and Gallera, G. Results of a developmental analysis of the male genital imaginal disc of *Drosophila melanogaster*.

The differentiations of transplanted fragments of larval male genital discs show that this disc is a patterned segregate consisting of many regions, each of which is able to regulate completely the development of a definite part of the genital apparatus (ejaculatory bulbs, claspers, etc.). In order to determine the region responsible for a given element of the apparatus, it is necessary to divide the respective region. Thus by cutting the disc in the median plane, we always obtain two ejaculatory bulbs and two penes. If a disc becomes divided by two paramedian cuts into a central part and two lateral parts, then we get only one penis and one ejaculatory bulb (from the central part), but now the number of claspers and anal plates increases so that each one of the three parts can form two of these elements. The structures are of normal shape and reach the same size as norma elements of an undivided disc. We find, for instance, that the mean number of bristles per anal plate or per clasper is the same whether the material of a disc forms two or six of such elements. Thus in the regulating regions the cell number increases till the specific normal size of an element is reached.

Herskowitz, Irwin H. Sexual behavior of an anterior-posterior gynandromorph.

A gynandromoroph of *Drosophila melanoga ter* was found that was male in the anterior half and female in the posteri half of its body. This fly was isolate with males and females alternately. When males started courting, including wing vibrations and extensions, the gynandromorph at first stood still, then decamped. The only activity it showed with females was to decamp quickly if a female came close. Even though the gynandromorph did not behave "properly" ir the presence of either males or females, it did lay several sterile eggs. Sin males of *D. melanogaster* copulate with etherized females (unpublished work of Herskowitz quoted in Streisinger, G., Evolution 2: 187-188, 1948), failure to copulate was the responsibility of the gynandromorph. Thus, although oviposition occurred, a female copulatory behavior pattern was not produced; and similarly, a male copulatory pattern was not imparted by the male genotype. This suggests that various parts of the nervous system need integration for th establishment of a copulatory behavior pattern.

Ives, Philip T., and Scott, Barbara A. A new allele of brown.

In the past two summers the Cy bw sp^2 chromosome has been used for analyzing collections of second chromosomes from the South Amherset wild populations. In 1947 a new allele of bw was found which, like bw^4, is normal phenotypically when homozygous. When crossed to several different brown stocks present in our laboratory, all nominally brown-one, but representing three slightly different phenotypes, and to bw^{2b}, it gav strikingly different results from bw^4. The only recessive bw with which it appears brown in phenotype is the bw of the Cy bw sp^2 chromosome. (It did not show bw with the Cy sp^2 chromosome from which Cy bw sp^2 arose by mutation.) The bw^4 allele shows a brown or modified brown with all the browns used except this new allele. In 1948 collections of July, August, and September from Sout Amherst, particular attention was given to the presence of this allele as indicated by the first-generation offspring from wild male x Bl/Cy bw sp^2 female. It was found to be present in about 2% of the chromosomes and in varying strengths from a good bw to a barely noticeable off-color when heterozygous with Cy bw sp^2. No attempts have been made to produce coisogenic or even completely homozygous stocks of the browns used in these tests; but it seems clear that this new allele, $bw^{47}j$, is different from bw^4 and that it represent a new addition to the many interesting and puzzling alleles known at this locu

Kikkawa, H. Chromoplasts (plastids) as enzyme producers.

As shown by many investigators, pigment granules (chromoplasts or plastids) found in Malpighian tubes of Drosophila and Bombyx are different in shape and color according to eye mutations. Assum ing that those chromoplasts are regarded as producers of enzymes concerned in tryptophane and pyrimidin metabolism, which are controlled by eye-mutant genes the whole system of pigment formation may be easily explained. Many experimental results support the view, and this may be applied to the mechanism of pigment formation in other organs of insects.

Kikkawa, H. (2) Kynurenine as a precursor of riboflavin. The yellow pigment having a strong fluorescence which is found in cells of Malpighian tubes of various insects, including Drosophila, is riboflavin (vitamin B_2). From various experiments, there is little doubt that this yellow pigment is derived from kynurenine. Therefore, riboflavin may be produced from the combination of a kynurenine derivative with a pyrimidin one, by functions of enzymes active in chromoplasts.

Kikkawa, H. (3) Eye pigments of insects as media of phototaxis. From a simple experiment comparing the phototaxis of bw flies with that of v bw flies, one may find that the former is always stronger than the latter. The artificial v^+ bw flies which are obtained from breeding in culture medium containing kynurenine also show a strong phototaxis as compared with the control v bw flies. The eye pigment of insects shows a strong absorptive band near the wave length 360 mu in cases where the range is extended to ultraviolet rays. As shown by Bertholf and others, the wave length 360 mu is the most effective for phototaxis of insects. The parallelism of these phenomena may throw light upon the nature of phototaxis.

King, R. C. The flight and hopping abilities of certain mutant stocks of *D. melanogaster*. A stock formerly called ct (Bishop) in the lists sent to DIS proved to have the genotype bi ct^6 g^2. Flies of this stock attempt to fly only under strong stimulation, and under such conditions exhibit only weak and erratic powers of flight. Such flies normally travel by walking and hopping. Flies of the constitutions ct^6/ct^6, ct^{461}/ct^{461}, ct^6/ct^{461}, and ct^n/ct^n are normal in these respects, while bi/bi flies behave as do bi ct^6 g^2 flies. The restricted flying ability is therefore probably due to bi, rather than to ct as had been supposed previously. These findings led to a search through some of the stocks at Yale for flies exhibiting related behavior. All flies examined were raised on the standard corn meal, molasses, agar food at room temperature. The findings are listed as follows: (1) al b c sp^2: can beat wings jerkily; cannot fly; travel by walking and hopping, al and b flies behave normally; effect probably due to c. (2) bc (Kiil, DIS-20): can beat wings; cannot fly; behavior resembles c. (3) bs^2 and bs^{Cy}: can beat wings and take off. Flying ability varies from absent or weak to nearly normal, probably depending on condition of wing surface, which is quite variable; strong hoppers. (4) dp and dp^{dr}: do not fly, but have been observed beating wings feebly while cleaning themselves; travel by walking and hopping. (5) Cy/+: can beat wings and take off; flight restricted to glides; travel by long gliding hops and walking. (6) Gl Sb/LVM: can beat wings, but unable to fly; experiments under way indicate inability to fly not due to either Gl or Sb. (7) m and m^2: can beat wings; flight restricted or absent; travel by walking and hopping. (8) Rvd/+: beat wings feebly if at all; flight absent; travel by walking and hopping. (9) w^a; ru h th st cu sr e^s ca: can twitch wings very feebly; unable to fly; weak hoppers; travel by walking. Not due to w^a or e^s; probably due to cu. (10) stw^D (Kiil): can beat wings; unable to fly; travel by walking and hopping.

Lewis, E. B. Location of c3G in the salivary-gland chromosomes. A new X-ray-induced deficiency, Df(3) sbd^{105}, behaves as a deficiency for c3G, sbd, and Sb, but not for kar, ss, or bx. The deficiency extends from the end of section 88F up to and including 89B4 (Bridges' 1935 map). Opposite a normal chromosome, sbd^{105} has a slight dominant effect of like homozygous sbd; opposite Sb, it is lethal. Small-scale tests show that sbd^{105}/c3G females have the same disjunctional and crossing-over-suppressing properties as homozygous c3G females. Since on the basis of other deficiency evidence sbd and Sb are found to lie in the region of 89B3,4, the genetic loc of c3G (formerly 55+) must lie between cv-c and Sb--that is, between 57.9?and 58.2.

MacFarlane, Jean, and Brink, R. F. An orange-eye mutation. A recessive orange-eye mutation arose spontaneously in an Xple stock carryin vermilion. It has been found to invol the V locus on the first, and a third-chromosome aberration. Investigation i incomplete.

Mittler, S. Breeding populations of D. melanogaster in a large metropolitan area. Analysis of second-chromosome lethals and visible mutants of wild population of D. melanogaster collected during th summer of 1947 in several localities c the Chicago area indicates that D. melanogaster breeds in small populations i large cities. This assumption is based on the large variation in percentage second-chromosome lethals in the collections from one locality to another.

Moriwaki, D. Exceptional males by nondisjunction fertile in D. ananassae. Out of 29 exceptional males which appeared as the result of nondisjunction of X chromosomes, 11 flies were fertil in D. ananassae, unlike the case in D. melanogaster. It is very likely, I suppose, that the genotype of these males might be "XO triplo-IV," and that the surplus IV substitutes for Y, making th XO males fertile. An intimate relation between X and IV has been known as a characteristic of this species, along with the fact that IV resembles the Y chromosome. It has not yet been proved exactly, as the investigation was interrupted by the loss of all the stocks. This is a résumé of the following two papers. 1943, Non-disjunction of the X-chromosome in Drosophila ananassa (in Japanese), Jap. Jour. Gen. 19: 108-110. 1944, Ibid. (a continuation), Ja Jour. Gen. 20:88.

Muir, Irene, and Brink, R. F. A new dumpy-like mutation. Investigation of a new dumpy-like muta tion arising from X-rayed wild stock proved it to be an allele of dumpy. Wing shape and truncation range from typical dumpy to almost wild-type, so th the presence of modifiers is suspected.

Muller, H. J. The construction of several new types of Y chromosomes. It was thought desirable to have a chr mosome consisting of the short arm of the Y, with a marker attached, to para lel the sc.$Y^{\underline{1}}$ which had been found useful in many experiments. For this purpose, as well as for further analysis of the point of breakage in the scute-V mutation described in DIS-21, males containing the X chromosome having this pericentric inversion and a normal Y chromosome were crossed with yellow fork females with doubly attached X's and a normal Y, and non-yellow forked female were looked for among the progeny. One of these was found and proved to be c the desired type, namely, a crossover having the short arm of the Y with the right-hand terminus of the X, including the locus of scute-VI and of non-yell attached to it beyond its centromere. This chromosome therefore has a perfec short arm, with all its fertility genes, and the other arm is no longer than the tiny right arm of the X chromosome. It is designated as sc^{VI}.Y^{S}.

In order to get a Y chromosome having the left end of the scute-8 chromo some attached to it, a similar cross was made, using however males whose X chromosome carried the scute-8 inversion. A non-yellow daughter was obtained which proved to have a Y chromosome comprising both long and short arms, but with the left-hand terminus of the scute-8 chromosome, including the genes y^{+} and ac^{+}, attached in place of the end of one of these arms. Cytological study of mitotic figures by Dr. A. M. Hannah indicated that the long arm had been lengthened so as to be about the size of an X and therefore had that portion of the heterochromatic region of the X which in the scute-8 chromosome is at the left end, attached to the long arm of the Y.

Before the cytological study was made a genetic analysis was undertaken to determine to which arm of the Y the scute-8 piece was attached. This was done by crossing males having the sc^{8}.Y, as we term it, and an X having the short arm of the Y attached, with yellow forked females having doubly attached X's, and in this case looking for daughters which were yellow. Three of these were found, and stocks containing the re-formed Y's were established. Flies from these stocks were then crossed to flies of two other stocks, having respectively the short arm of the Y and the long arm of the Y attached to their X, in order to determine, from the fertility of the male offspring, which arms of the Y were represented in the newly formed Y chromosomes. Two of them proved to have only the short arm of the Y. It was concluded that these, having occurred by crossing over between the sc^{8}.Y and the heterochromatic region of the X that had the short arm of the Y attached, consisted of two short arms of the Y attached to one another at their centromere. These chromosomes are designated as $Y^{s}.Y^{s}$#2 and #3 respectively, since the first such case was found by Stern. This at the same time implied that the sc^{8} piece had been attached to the long arm, not represented in these crossover chromosomes. As for the third case, the fertility tests showed it to have all the necessary fertility genes of the long arm of the Y but not to have those (or not all of those) of the short arm. At the same time, this chromosome behaved as though it either lacked the locus of bobbed or had only a very extreme allele of bobbed. It was concluded from this genetic evidence that this chromosome had not resulted from crossing over between X and Y but from breakage of the long arm between the fertility genes and the sc^{8} piece and breakage of the short arm of the Y basally to $bobbed^{+}$ and to all or some of its fertility genes, followed by union of both proximal broken ends with each other to form a ring chromosome. Cytological examination of mitotic figures by Dr. Hannah then showed conclusively that this Y chromosome is in fact in the form of a ring. Its mitotic length seems about equal to that of an X. Considering, however, that practically all of this mitotic length is due to a very few blocks, it is noteworthy that a ring chromosome with so few genes can survive and multiply.

This new "closed" $Y^{\underline{1}}$ is designated as $Y^{c\underline{1}}$. It is kept in stocks in which the males, in order to be fertile, have a Y^{s} attached to their X. It is to be noted that this is a very good way to keep a stock having the short arm of the Y attached to the X, since it can never be lost by crossing over with the Y, for such crossing over would produce a dicentric chromosome. This is also a useful way to keep stocks of attached X chromosomes of the ordinary, singly attached type. For crossing over between such an X.X and the ring-shaped Y would again form a dicentric chromosome that would be lost. Hence we are in process of converting all our ordinary attached X stocks to this form.

These Y's are to be studied for their effects on segregation, and on the expression of heterochromatic displacements.

Nolte, D. J. A graded series of eye colors due to interaction of genes.

Since the paucity of stocks of this laboratory has been rectified during the course of this year, espcially through the courtesy of Dr. M. Demerec of Cold Spring Harbor, the interaction-product of a white eye color in our "y w" stock, as reported in DIS-18, has been determined to be conditioned by the compound w^c rb. With this stock as example, a series of compounds of the multiple alleles w^{sat}, w^{bl}, w^{co}, w^{ch}, w^e, and w^a with each of the mutants rb cm, g and car has been built up, and has yielded graded series of eye colors. The last named four genes have a dilution effect on each of the multiple alleles, with a decreasing power of dilution of the four in the named order.

Comparison of phenotypes with the Munsell Color Atlas has indicated discrete grades of color ranging from a dark red through the browns, oranges, an yellows to white. In addition, compounds of rb, cm, g, and car are being bui up in an attempt to determine the relations between these more-or-less-simila mutant types. Histological sections of the different mutants and compounds have indicated the reality of the dilution effect, but this cannot be based c the concentration of pigment in the four dilutors since these do not show a decreasing concentration in the named order.

Concentrations of pigment will now be determined spectrophotometrically in order to ascertain the possible roles of the red and the brown components, or of other factors, in this dilution series.

The mutant ras^2 has very little effect in compounds with the w-series, b histologically our ras^2 stock seems to have an eye color effect correlated wi a derangement or abnormality of the secondary pigment cells of the eye.

Novitski, E., and Rush, G.
Tolerance of Drosophila melanogaster to sub-zero temperature.

In conjunction with experiments on the effects of X-rays combined with low te peratures, information was obtained on the tolerances of Drosophila to sub-ze temperatures during the time intervals encountered in the usual X-ray exposur For this purpose, a heating unit, thermostat, and blower were placed in a dee freeze unit so that accurately controlled sub-zero temperatures could be main tained. The individuals to be treated were placed in size 00 gelatin capsule punctured at both ends to facilitate rapid cooling when placed in the cold ai blast.

The observations may be summarized as follows. At -5°C. about 50% mortality of the Canton-S individuals used throughout these tests was reached after two hours; at -10°C. a 20-minute exposure kills very few whereas a 25-minute exposure is almost completely lethal; at -15°C. about 50% will survive exposures less than 10 minutes long, an exposure of 13 minutes or longer is completely lethal; at -20°C. all the flies are killed within 2 minutes, which thermocouple tests show is shorter than the time required for the flies to reach the temperature of the surrounding air blast. Males and females react similarly. Various combinations of pretreatments have been tried in an atten to prolong life at low temperatures, with no success. It has been noticed, however, that complete recovery from etherization is essential for maximum recovery from these exposures.

Novitski, E., and Rush G. (2)
Desemination by low-temperature shocks.

Fertilized Drosophila melanogaster females may be deseminated (see Muller, DIS-18) by exposure to sub-zero temper tures. About 16% of such deseminated females produce single offspring; these apparently represent eggs already fer tilized and in the oviduct at the time of treatment, because their frequency cannot be decreased by two successive exposures and because they always hatch from eggs laid during the first 24-hour period after treatment. Cold shocks -5°C. for 75 and 90 minutes and of -10°C. for 5 to 20 minutes, applied in the manner described in the preceding note, have been 100% effective, except for the sporadic progeny. This treatment has been used with very good results in experiments where large numbers of virgins have been needed.

Ogaki, M., and Oshima, C. Phenocopies induced by photodynamic dye and near infrared rays.

Third-instar larvae of the Oregon strain of *Drosophila melanogaster* and of some strains of *D. virilis* are being tested for induction of phenocopies by photodynamic dye (Illuminol R II) and near infrared rays. Some results obtained so far are reported here. For irradiation, the larvae were placed in a glass tube, with about 1 cc. of 0.01% dye solution, and exposed to the light from a 60- or a 500-watt projection lamp at a distance of 15 cm. Between the light source and the tube, a water bath and Riken VR3 filter were placed. The glass tube was cooled with an electric fan, and the temperature of the atmosphere and of the liquid in the tube was kept at not more than one degree above the room temperature throughout the experiments. After irradiation the larvae were washed with distilled water, and placed in shell vials to complete development. Three hundred larvae, 60-100 hours after hatching (Oregon strain), were exposed for 300 minutes to the beam of a 60-watt lamp. About 58% became flies, and of these 5.8% showed abnormalities. Of 250 larvae treated with 500-watt radiation (without VR3) for 30 minutes, about 67% became flies, and of these 3% showed abnormalities. Larvae of the ebony strain of *D. virilis* were also tested. Irradiation for 30 minutes with a 500-watt lamp induced 12.5% abnormalities of all 40 flies. Eggs from a strain of *D. virilis* dechorionated by sodium hypochlorite were immersed in the dye solution. These eggs were exposed for 30 minutes to the beam of a 6-watt lamp. Of 96 eggs treated, about 10% were stained by the dye which entered through the micropiles. From these eggs no flies emerged. Among 45 flies obtained from 96 eggs, two females had no scutella. Many kinds of "phenocopies"—abnormal abdomen, white, missing bristles, folded wings, no mouth, etc.--appeared after these treatments. No indication was found, however, that irradiation at a particular developmental stage tended to produce a particular kind of change, as was found by Villee and Lavin (1947) with visible light and photodynamic dye (cyanin). All abnormal individuals are being tested for their heredity. It seems that abnormal flies as a rule have very low fertility.

Oshima, C. Low fertility of hybrids between *D. virilis* and *D. americana* which have X^{v-a} (compound X of *virilis-americana*), Y^v (Y of *virilis*), and A^v (autosomes of *virilis*)

D. americana females were crossed with *virilis* mt-we males, and the F_1 were mated with *virilis* y-ap males. The females produced were then mated with mt-w^e males. Three equational nondisjunctional y females were found among the females in the next generation. These hybrid females were found, by observation of the salivary-gland chromosomes, to have X^{v-a}, X^v, Y^v, and A^v. In the X was the *americana* overlapping inversion. The gonial metaphase showed one V-shaped chromosome (X^{v-a}-4), eight rod- and two dot-shaped chromosomes. These females were crossed with *virilis* bb males and yielded:

♀ X^{v-a} X^v(y/y-ap) x ♂ X^v Y^v(bb)

F_1 ♀	(+)	Exc.(y)	(bb)	♂	(y)	(y-ap)	Exc.(+)	Exc.(bb)	T.
	3077	388	3		888	1426	371	9	6162

Thus the females produced very high secondary nondisjunction--about 12.5% and the F_1 y males (X^{v-a} Y^v) were less in number than y-ap males (X^v Y^v) in all vials. The fertility of the former was much lower than the latter when tested by means of the competitive cross with y-ap females. The low fertility of the heterozygous males is probably due to a factor (or factors) existing in americana's X which disturbs the genic balance of X and Y, something like in the case of montana and texana hybrids, though it is apparently less effective The unexpected bobbed females were probably due to crossing over between X^{v-a} and X^v, at a locus between ap and bb. The americana's inert region probably has a deficiency in bobbed locus, and the factor (or factors) in americana's X mentioned above possibly has some relation to this deficiency.

Slizynski, B. M. Cytological limits of In-S.

Bridges and Brehme's book describes, under sc^{S1}, an inversion in the X chromosome for which analysis by Muller and Prokofieva showed that besides the large inversion and inside of it there is also an inner inversion, smaller than In(1) dl-49 and having its breaks inside those of In(1)dl-49. Demerec (Genetics 33: 337-348) quotes Dr. Bruce Wallace, who determined the break points of the inner inversion as: first break in region 6AB, second break in section 10F. Incidentally, I have found a figure in which the limits of the small inversion may be determined down to bands. The first break occurred just after the 6A1,2 capsule, the second break after 10F10 but before 11A1,2. The fate of the 10F11 faint band is not known. The new chromosomes is-----6A1,2/10F10-----6A3,4/11A1,2-----.

Strømnaes, Øistein The production of dominant lethals with X-rays in aged Drosophila melanogaster sperms.

Male flies from an Oregon-R-C stock wer stored alone for from 1 to 23 days and then given a dose of 2300 r of X-rays. The treated males were mated to virgin females. The percentage of dominant lethals induced was determined as the per centage of eggs that failed to hatch. The experiments showed an increase in dominant lethals induced correlated with an increase in age of the sperms at time of irradiation. Thus, 1-day-old sperms gave ca. 45% dominant lethals, an 17-day-old sperms ca. 69%. In the control series, with untreated males, no increase in dominant lethals was observed with an increase in age of the sperm When the males, before irradiation, had been stored with an excessive number o females, no increase in dominant lethals was observed until the 15-day male group. Then, however, a drastic increase was observed, which is attributed partially to the exhaustion of sperm due to the high level of sexual activity of the males, and partially to their radiation of very young and immature sperms. An experiment was carried out chiefly to determine whether early or late development would make any difference in sensitivity to exposure to X-rays. Early-developing males, when irradiated at 1 day of age, gave about 68% dominant lethals, and late-developing males gave about 49%. Both groups gave about 65% when irradiated at 15 days of age. The interesting hypothesis is suggested that only sperms from late-developing males show an age effect with regard to sensitivity to induction of dominant lethal mutations by X-rays. Further experiments are in progress to test the hypothesis.

Suley, A. C. E. Modifiers of the expression of the gene grandchildless.

All the offspring of a gs/gs (chr.3) female are sterile and have reduced gonads (Spurway, DIS-20). When two lines segregating for the gene were crossed together, abnormal cultures in the resulting stock contained only 2%-20% of sterile flies in the offspring of paired matings. It was now possible to breed from sibs of sterile flies instead of from their cousins. But after about nine generations of this type of stock-keeping (paired matings), the stock has three times become so sterile that it was only saved by outcrossing. There is evidence that once, just before this happened, the stock had become homozygous. The condition appears to be due not to a mimic gene, but to mater nally acting modifiers, which reduce the proportion of offspring that are affected. This complex of modifiers appears to be recessive to those in the normal gs stock. The laboratory stock of nt does not contain modifiers which can restore the normal gs expression by the F_3 (test of F_2) when the new stock is outcrossed to nt. This outcross also suggests that the modifiers in the new stock can very occasionally produce sterile flies when the gs gene is absent.

Suley, A. C. E. and Milani, R. Transplantation of gonads between wild-type *D. subobscura* and the offspring of homozygous grandchildless females.

Third-instar larvae of gs/gs females have gonad discs very slightly smaller than discs of wild-type larvae. Transplants to wild-type larvae develop autonomously. That is, the gonad implant, three days after the eclosion of the host, appears like the minute gonad of the sterile offspring of a gs/gs female. Therefore, either the effect of a gs/gs female on her offspring is directly on the germ line, or any general effect, through the soma of the offspring, takes place before the third instar is reached. Gonad implants from wild-type larvae to the offspring of gs/gs females also develop autonomously.

Whittinghill, M. Lethals in chromosome 3 wanted.

I would like to be informed of the availability of recessive lethal stocks having any lethal near locus 40 or near locus 58 in chromosome 3.

Wolfe, Leslie, and Brink, R. F. Susceptibility to X-ray radiation at different stages of development.

X-ray radiation of 7080 R. U. was applied under constant conditions to 50 representatives of each 24-hour period in the life of the pre-adult Drosophila. The egg and larval stages proved to be highly susceptible, with 100% lethability. but the lethal effect was delayed until after pupation, 80-98% forming pupa. The X-rayed pupae showed a variable susceptibility, 60% emerging from the 144- to 168-hour group, 76% from the 168-to 192-hour group, and 60% from the 192- to 216-hour group. This difference in susceptibility is closely correlated with changes in physiological activity occurring during these periods of development. The differential fertility existing in surviving flies and the structural abnormalities occurring in the imagos could be correlated in many cases with developmental changes which were proceeding at the time of irradiation.

TECHNICAL NOTES

Clark, Carl A flotation method for the collection of insect eggs. During a recent review of Drosophila embryology, a flotation method was developed for the rapid collection of large numbers of eggs from the food on which they were deposited. Cups of fresh food were put into a Drosophila population cage containing about 2000 flies, for a specified time. The cups were then removed, and the surface laye of food, containing the eggs, was scraped into a 100-cc. graduate cylinder containing 75 cc. of saturated salt water. The cylinder was shaken and stirred, causing the food to sink to the bottom of the salt water and the eggs to float to the top. The cylinder was then filled to the top with salt water and the floating eggs, free of food, were poured off. The eggs do not float in fresh water. For other insects than Drosophila perhaps other fluids of other specif gravities will be required for the separation of eggs from food.

The embryos are still alive. A chemical study might well be made of this copious material. If the food cups are put into the population cage for, say, one-half hour and then removed, a series of closely isochronic embryos can the be collected for study. If all the flies in the population cage represent a particular genetic cross, the large numbers of collected embryos are sibs.

For the embryological work, the eggs were poured directly from the cylind into a 25-cc. Stendor dish containing 15 cc. of 5.25% sodium hypochlorite (as the commerical Chlorox, Veedox, etc.) for chemical dechorionation. (Slifer, Eleanor H., Removing the shells from living Drosophila eggs. Science 102:282, 1945.) With care, the eggs can be decanted from the cylinder with less than 10 cc. of water, giving a final hypochlorite solution powerful enough to remov the chorions in two minutes. The eggs float in this solution; any food still with the eggs sinks to the bottom. Eggs about four minutes in sodium hypochlorite are damaged, as shown by the black border they develop in hematoxylin stained sections. The eggs and hypochlorite solution are poured from the Stendor dish into a 100-cc. graduate, which is then filled with distilled water, in which the eggs sink. This water is changed, and the clean dechorionated eggs are ready for further study.

The embryos are still alive. (Hill, David, Chemical removal of the chorion from Drosophila eggs. DIS-19: 62, 1945.) Certain organological changes in the dechorionated living embryo can be observed with a microscope. Dark-field illumination and phase microscopy should be of help here. The whole eggs may be stained.

For fixation and staining, the embryos are transferred to 3.5-cc. vials. Even with mechanical dechorionation, Huettner recommends that the eggs be punctured with a fine needle for proper fixation. (Huettner, Alfred, Origin of the germ cells in Drosophila. J. Morph. 37: 385-423, 1923.) It was suggested by this work that satisfactory fixation was obtained for the chemically dechorionated mateial without puncturing. FAA fixative (5 parts 37% formaldehyde : 15 parts 70% alcohol : 1 part glacial acetic acid) was used for eight hours. The further procedures employed for staining and sectioning are standard. (Rabinowitz, Morris, Studies on the cytology and early embryology of the egg of Drosophila melanogaster. J. Morph. 69: 1-50, 1941.)

Rifenburgh, S. S. Ridding Drosophila stocks of mites. The cultures and shelves in our laboratory were badly infested with mites, which were apparently similar to thos reported on by Hughes in DIS-20. After trying various procedures and several messy acaricides, a method was developed which has kept our stocks free from mites for more than two years.

In getting rid of mites, two steps much be successfully accomplished: (1) start mite-free cultures, and (2) prevent mites from migrating into such cultures. The first step was done by successive transfers at five-day intervals. A slight change was made in the technique of transferring stocks, in order to prevent shaking mites off the old plug into the new culture bottle. Under the conditions obtaining in our laboratory, five days was long enough for most of the hypopi to transform into adults and settle down, but not long enough for the next generation to appear. The second step was finally worked out successfully by sprinkling the shelves where cultures are kept with a coat of powdered sulfur, and by making sure that the culture bottles--including the cotton plugs--were far enough apart to prevent them from touching each other.

Slizynski, B. M. An improved method for squash preparations. In making permanent squash preparations the most troublesome point is that very frequently the cover slip does not go off. It has been noticed that in such cases, when the cover slip is forced away (with razor blade, etc.), most of the material does not stick to the albuminized slide and is in the majority of cases completely lost.

The new technique is as follows. Dissection in 45% acetic acid (with carmine, lackmoid, or orcein stain); staining 10-20 minutes. Afterwards the glands are transferred onto a clean slide and placed there in a small (2- to 3-mm. diameter) drop of stain. An albuminized slide is now placed over the clean slide, with its albuminous layer facing down. The albuminized slide is rested by one end on the clean slide (about 1 cm. from its end), the other end being lifted at an angle of about 45°. By forcibly letting the lifted end fall down on the preparation, necessary crushing of nuclei is obtained. After that some additional pressure is applied with a finger tip. The two slides are then submerged in 45% acetic acid, in which--in about half an hour--the albumized slide, together with all the material sticking to it, slides down and may be carefully transferred to alcohol for further procedure.

Strømnaes, Øistein Egg-counting made easy. The author uses a small creamer (i.e., a miniature milk bottle of 20 cc. capacity) to store the egg-laying female, and places the food on the cap covering the creamer. The food consists of equal parts of mashed banana (the pulp filtered away) and a 4% agar solution. If desired, molasses can be added to darken the solution. Small rectangles (12 x 17 mm.) of black filter paper are dipped in the culture medium and placed on wet paper towels. After a few minutes they are dipped again and then placed on the cap. To facilitate the egg count, a line can be drawn with a knife, in the medium, along the middle of the rectangle. The caps with fresh food are kept moist by placing them on wet paper towels between two glass plates until they are used. Experience has shown that the flies lay all their eggs on the culture medium. A drop of very dilute yeast suspension is added to the food on those caps used for egg counting, and a heavy yeast suspension on those used when only storing the females. In the latter case the author found it more convenient to add the culture medium directly on the caps, using an eye dropper. More medium is needed if the caps are not paraffinized. This method makes it easy to obtain samples, which can be readily counted and stored for later observation of the hatchability of the eggs.

Research Notes

Asahina, Kazuo Sex ratio of *D. melanogaster.* Negative results have been obtained in tests of some conditions which seem to have an influence on the sex determination of *D. melanogaster*. But on its sex-ratio can recognize certain influences of several ions (As, CN, etc.), and the age of spermatozoa at the time of fertilization. Moreover studying on which status of the genetic process they operate actively, it should be noted, has very important significance in the theory of so-called "environmental heredity." H-ion, ultraviolet rays, X-rays, and sexual hormones have no definite influences on it.

Auerbach, C. Tests of chemical substances for mutageric ability. (1) *Pyrogallol* (in co-operation with Dr. M. Bird). This substance was tested because it was the most effective of the phenols which in the experiments of Levan and Hin Tjio produced chromosome fragmentation. Meanwhile Therman-Suomaleinen had shown that this effect is more or less restricted to Allium chromosomes; but this work was not known to us at the time. Treatment was given by injection into young imaginal females. Three concentrations were used: .0013%, .002%, and .005%. None of these was harmful to the flies; but, taking account of the dilution by abdominal fluid, they are in the range of the concentrations that were most effective on Allium chromosomes. The treated females of theconstitution $+/sc^{S1}$ InS w^a sc^8; +/Cy were mated to sc^{S1} InS w^a sc^8; Cy/L males, and six days later they were transferred with their mates to fresh vials. The two broods were scored separately in order to detect a possible dependance of sensitivity to pyrogallol on the age of the germ cells. In all 6 series (3 treatments, 2 broods) both sex-linked and autosomal lethals on the wild-type chromosomes were scored. The result was entirely negative. Only 1 autosomal and 2 sex-linked lethals occurred in over 1,000 cultures for each test. Four second-chromosome lethals had been present at the start of the experiment. One occurred in 6 females, one in 3, and 2 singly. Thus 11 of 115 P_1 females, including controls, were heterozygous for a second-chromosome lethal. The one autosomal lethal that arose *de novo* was identical with one of those present in the stock. This, taken together with Mather's observation (John Innes Report for 1948) that the same second-chromosome lethal arose spontaneously twice in the same experiment, suggests that the second chromosome may possess some loci that mutate easily; it may have a bearing on Hadorn's finding of identical autosomal lethals after phenol treatment.

(2) *Chloropicrin*. This substance was tested because it is a strong sulfhydril poison. In the first tests, in which adult males were exposed to vapor of undiluted chloropicrin, the highest dose that could be tolerated by a minority was 3 minutes. Only 1 sex-linked lethal was found in 1318 chromosomes from males that had been exposed for 2-3 minutes. In later tests, chloropicrin was diluted with liquid paraffin; this raised the threshold of tolerance to 7 minutes or more, a time amply sufficient for the induction of mutations by mustard gas or nitrogen mustard. Males that had been exposed for 7 or more minutes were mated to a succession of fresh females, so as to obtain progeny from germ cells that at the time of treatment had been immature and presumably more sensitive toenzyme poisoning than mature sperm. Mutation rates in three such experiments did not exceed 0.1%. This, together with the negative results obtained previously with lewisite, another strong sulfhydril poison, indicates that attack on SH-groups is not responsible for the production of mutations by mustard gas and X-rays. It also makes it seem unlikely that the increased mutation rate in later broods, which has been observed after mustard gas treatment, is due to inhibition of phosphokinases in immature germ cells.

(3) Sodium desoxycholate. This substance has given positive results on bacteria (Witkin) and Drosophila (Demerec). It was injected into the abdomen of young imaginal males. The highest concentration tolerated was 0.3%. Only 1 sex-linked lethal was found in 1000 progeny of males that had been injected with concentrations varying between 0.2 and 0.3%.

(4) Nitrogen mustard as injection. A watery solution of bis-(2-chloroethyl)amine hydrochloride, buffered with $NaHCO_3$, was injected into young imaginal males. 0.1% was the highest dose tolerated. In 60 chromosomes from males treated with this dose, there were 2 sex-linked lethals and 1 almost-lethal; with lower doses the genetical effects became negligible. The injection method is obviously not suitable for work with such highly toxic substances.

(5) Formalin vapor. Adult males and females and larvae of various ages were exposed to formalin vapor for periods from 30 minutes to 2 hours. Their progeny--in the case of the adults, four successive broods separated from one another by 5 days--were examined for sex-linked lethals. All results were negative. This indicates that formalin by itself is not mutagenic, and that the mutagenic ability of formalin-treated food is due to some reaction product formed with a component of the food. Experiments to identify this component are under way.

Auerbach, C., and Moser, H. Analysis of the genetical action of formalin-treated food.

(1) There exists a sensitive period of the larval germ cells to the mutagenic action of formalin food. It is not identical with the sensitive period of the larvae to the toxic effect of the food. Eggs from Ore-K females were collected twice daily. They and the larvae emerging from them were kept on normal food at 25° C. for a varying number of days before transfer to formalin food (0.2% HCHO, on the basis of the water used in the preparation of the food). In several series the larvae were put back onto normal food after one or two days on the treated food. The results showed that sensitivity of the larvae to the toxic action of the food is highest during the first day after emergence--that is, during the first instar--but that the great majority of mutations are produced during the following 48 hours--that is, during the second and early third instar. Larvae 48 hours old (counted from the laying of the eggs) were put on formalin food, and some of them were removed after 24 hours; mutation frequency in their progeny was sensibly the same as in the progeny of the remainder of the larvae, which had completed development on the treated food. Larvae more than 72 hours old no longer react genetically to formalin food, and larvae before the sensitive period--i.e., during the first day of life--react very little. In two experiments in which larvae 24 hours and 48 hours old were put on formalin food and left to complete development, the former developed fewer mutations than the latter. When males that have spent the sensitive period on formalin food are mated twice in succession, with an interval of 5 days between matings, mutation frequency is significantly lower in the second brood. This indicates that only or preferentially the oldest germ cells react during the sensitive period, an observation which may have a connection with the finding by Lamy and by Muller that spontaneous mutations occur mainly in the first sperm used.

(2) There exists a negative correlation between the amount of damage done to the larvae and the frequency of induced mutations. In various experiments it was found that, for a given concentration of formalin in the food, conditions that allow the highest rate of survival are most favorable

for the production of mutations. One example--the relatively low mutation rate in larvae that have been transferred to formalin food immediately after emergence--has been quoted under (1). Another came from an experiment in which the yeast in the food had been pretreated with different concentrations of formalin. Although the mutagenic effect in this experiment was small, probably because treatment of the yeast had been too short, it allowed a comparison between the two extreme treatments. For the highest concentration, survival rate was half and mutation frequency double that of the lowest. Finally, an experiment was made using the same concentration of formalin (.18% HCHO) and the same amount of yeast in three different media: A, with additional maizemeal and treacle; B, with additional dextrose; C, with no additional nutrients. Survival was good and development normal in A and B, possibly somewhat better in A; in C, development was prolonged, survival rate low, and the emerging flies small and weak. Mutation rates, determined for 3-400 X chromosomes in each series, were 9.4% in A, 5.7% in B, and 0 in C. Various possible explanations of these results are now under test. In any case, these data make it appear unlikely that formalin food produces mutation through starving the larvae or depriving them of some food constituent.

(3) Formalin produces the same types of mutation as X-rays and mustard gas. Lethals, visibles, small deficiencies, large deletions, inversions, and one probable translocation (under test) have been obtained. There is a suggestion that visibles are slightly less frequent and large deletions slightly more frequent than after mustard gas. Translocations are infrequent, as after mustard gas. Only one translocation between chromosomes 2 and 3 was found in over 200 spermatozoa from flies that had yielded 5.7% sex-linked lethals, and none in over 100 from flies that had yielded 9.4% lethals. Mosaics and gonadic mosaics are as frequent as after mustard gas, and are found even in the F_1 of flies that have been treated only during the second and third days of larval life. Gynandromorphs seem to be fairly frequent: 12 were found among 14,500 daughters of treated males and untreated y w sn females.

Barigozzi, C. Investigations reported previously (DIS-22) on the genetics of the Y chromosome have been continued. Three characters controlled by the Y chromosome are being systematically studied in *melanogaster*: size of cornea, frequency of hairs on the wing surface, and facet irregularities in heterozygotes with Me. The investigation is being made on stocks in which Y's from different wild strains are brought together, with the remaining elements of the genome identical in the different stocks. This is done using markers of the first, second, and third chromosomes. Analogous investigations are being started with *D. pseudoobscura*.

Barigozzi, C., and Semenza, L. A new Notch has been described, showing the typical wing aspect, without lethality in the male. In double doses (XX) it is less viable than in single (XY), and therefore the sex ratio is in favor of the males (♂♂ 871: ♀♀ 676).

Bird, M. J. Three compounds in the class of nitrogen mustards were tested for their mutagenic effects. They were: R.44, NN-Di-(2-chloroethyl)-p-toluidine; R.45, NN-Di-(2-chloroethyl)-p-anisidine; R.48, beta-Naphthyldi-(2-chloroethyl)amine.

Except for R.48 0.1%, they were all dissolved in arachis oil and then added to a yeast agar medium. R.48 0.1% was used in an alcoholic solution. A counted number of newly hatched larvae from a wild-type stock of *Drosophila melanogaster* (Oregon-K) were reared on these media. Some of the males that emerged were tested for sex-linked recessive lethals, using the Muller-5 stock.

For two of the dosage levels of R.44 and one of R.48, these males were also mated to y v f dp:e females and the F_1 scored for large deletions and visibles. R.44 was the most toxic, and at 0.01% dosage level only 1.8% of the larvae completed their development. Of the adults obtained, 95% had abnormal abdomens, the sclerites were grossly deformed and the pigmentation disturbed. Table 1 shows the P_1 survival rates calculated as a percentage of the control flies that emerged in the same experiments. The percentage of flies with abnormal abdomens is also given.

Table 1 - P_1

Substance	Dosage level %	P_1 % survival	% with abnormal abdomens
R.44	0.003	89	8
R.44	0.007	65	81
R.45	0.07	78	4
R.45	0.09	45	3
R.48	0.07	92	0
R.48	0.1	45	0

In R.44 0.007%, only males with abnormal abdomens were tested, but in the 0.003% dosage level all the males tested were normal. Table 2 shows the F_2 results of the tests for sex-linked recessive lethals. The test males were mated to several females and when 5-7 days old were remated, thus giving Brood I and Brood II. In all tests the mutation rate was higher in Brood I. Several males gave more than one lethal, and these lethals are being tested to see whether they form a cluster. The figures for the controls in Table 2 are the combined data of several experiments.

Table 2 - F_2

	Brood I		Brood II		Total		I	II	Total
Substance and dosage level	Chr.	l	Chr.	l	Chr.	l	% l	% l	% l
R.44 0.003%	745	14	235	2	980	16	1.9	0.9	1.6
R.44 0.007%	681	23	286	4	967	27	3.4	1.4	2.8
R.45 0.07%	317	9	1327	11	1644	20	2.9	0.8	1.2
R.45 0.09%	192	7	273	2	465	9	3.6	0.7	1.9
R.48 0.07%	591	5	277	2	868	7	0.8	0.7	0.8
R.48 0.1	558	5	398	0	956	5	0.9	0	0.5
Controls	1527	5	2466	3	3993	6	0.3	0.1	0.2

Chr. = chromosomes tested; l = lethals

In the test for large deletions and visibles, only one deleted fragment was found in R.44 0.003%. Most of the visibles found were Minutes; the numbers are given in Table 3. Of the 40 Minutes found, 14 were sterile, 10 produced a small second generation with no Minutes, and 16 bred as normal autosomal Minutes (these are shown in brackets in the table). A small number of sex-linked recessive visible mutations and autosomal dominants were found, as well as a large number of phenotypic effects such as blistered wings, which appeared to be nongenetic. Three fractional Minutes found are not included in the data.

Table 3 - F_1

Substance and dosage level	Normal diploid F_1 females	Females hyperploid for a deleted-X	Wild-type F_1 males	Minutes	% Minutes
R.44 0.003%	1296	1	1456	19 (8)	1.3
R.44 0.007%	1276	0	1299	12 (5)	0.9
R.48 0.07%	916	0	1004	9 (3)	0.9
Controls	647	0	711	1 (1)	0.1

R.48 has been found to be a carcinogen (unpublished data), but R.44 and R.45 have not yet been tested. Chemically R.48 is the least reactive, and, from the results shown here, of the three it is also the weakest mutagen. Th data show that all these substances are capable of producing lethals and visible mutations. Only R.44 was adequately tested for producing chromosome breaks, and gave negative results.

Bonnier, G. and Lüning, K. G.
Influence of time and age after X-ray irradiation on chromosomal behavior.

Wild males were irradiated (about 2900 r and mated to y w sn females. Four different series were made: (1) freshly hatched males were irradiated and mated immediately; (2) freshly hatched males were irradiated and thereafter kept without females for one week, with subsequent mating; (3) males were kept without females for one week and then irrad ated and mated; (4) males were kept without females for one week, then irradi ated and kept without females for another week and then mated. The female (a gynandromorph) progeny in each of these series numbered about 40000. The pro portions of gynandromorphs and translocations (w sn and sn males) were very similar in the last three series, but differed considerably from the first series. These proportions (per 10,000) were in the first series 11.8 and 5.3 and in the pooled last three series 7.2 and 8.4. The differences are statist cally significant.

As the first series was easier to keep and gave larger progenies, studie were undertaken of the hatchability of the eggs after different treatments of the males. Round 150,000 eggs have so far been counted in several repetition of the experiments. Though a few series deviate somewhat too much from the bulk of the experiments, the results give a fairly consistent picture. Controls gave a hatchability of between 80 and 90 per cent. When freshly hatche wild males were irradiated and immediately mated, the hatchability was 50% or somewhat less. However, when the newly hatched males were irradiated and the kept for a week before mating, and also when both irradiation and mating were postponed for a week, the hatchability of the eggs decreased to 30% or less. Several variants of these experiments were performed. The keeping of the mal before mating with or without females seems to be without influence.

In the four series mentioned in the first paragraph it was not possible compare the frequencies of gynandromorphs due to maternal and paternal elimin tions, as there were no marker genes in the irradiated males. To make such a comparison, and also to study in more detail Patterson's finding that the paternal X's also are eliminated after irradiation of females, we have irradi ated w sn females (2200 r) and mated them to y f car males. Three series hav been carried out: (1) freshly hatched females were irradiated and mated immediately; (2) freshly hatched females were irradiated and mated after a lapse of one week; (3) 1-week-old females were irradiated and then mated. To these series was added a control series with mating of freshly hatched females. So far the total female (and gynandromorph) progeny (round figures) and the number of gynandromorphs due to maternal and paternal eliminations are (in that order): series (1), 60,000, 8, 7; series (2), 50,000, 10, 21; series (3), 60,000, 6, 14. In the controls the corresponding figures are 55,000, 6,7. Patterson's findings are thus confirmed by the present study. The proportion between the two kinds of gynandromorphs conforms well to a 1:1 ratio in series (1) and in the controls, but decidedly does not in series (2) and (3).

Brncic, D. and Briones, H. Tumors and nutrition (summary). The effects of variations in nutrition on the spontaneous incidence of melanic tumors were studied in one wild and two tumoral strains of *Drosophila melanogaster* (st, sr (tu), and bw (tu)). These variations were brought about by means of modifications of the concentration of *Torulopsis utilis* in Birsch's synthetic medium. During the course of five different experiments, in which 5126 larvae at the end-stage of their development were examined, it was observed that culture media that were rich in yeast lowered the tumoral incidence, whereas media poor in this fungus increased it, regardless of the decrease in viability. These results were observed in all three strains, but were statistically significant only in the two tumoral strains. The low tumoral incidence observed in culture media with high yeast concentration did not seem to be related to a decrease of viability or a shortening of the larval period, at least in the strains st and sr(tu). In the wild Oregon-R strain, the type of nutrition modified the duration of the developmental stage of the larvae, but in this case the antitumoral effect was extremely low and statistically not significant. Nothing is known yet about which element or group of elements of *Torulopsis utilis* is responsible for the protecting effect. The possibility of participation of the vitamin B complex and of proteins, which are abundantly present in this type of yeast, is discussed in the published work. It is not possible in this case, as it would be in mammals, to relate it to the antitumoral action of caloric restrictions, as we have observed in Drosophila a lowering of the tumoral incidence precisely in overfed and overweight larvae. This peculiar property discovered in *T. utilis* might be another argument for its use in human nutrition, besides it high nutritional value and easy and cheap manufacture.

Burdette, Walter J. Separation of sterility factor from sn. A stock of w^e with a sterility factor but without sn was obtained from a w^e sn stock in the following manner. Oregon-R virgins were mated to w^e sn males in order to obtain w^e flies that were not carried in the laboratory cultures. One w^e male was found among the progeny of the F_1 heterozygous females, and a pure stock was obtained. Although the w^e males were fertile, it was soon found that the w^e females were sterile. The ClB chromosome was utilized to provide a balanced stock. Eggs were laid by each of 30 w^e females mated to Oregon-R males, but none hatched. In another experiment, 16 of these females were observed to copulate; eggs were laid by all, but no larvae appeared. Sperm were very active in sperm receptacles and spermathecae shortly after copulation in 3 females dissected, and motile but sluggish 48 hours later in 3 others. Only 11 out of 40 heterozygous females (w^e/w^e sn) laid eggs when mated to Oregon-R males, and no larvae developed from them. Apparently the sterility factor in the w^e stock described and the one associated with sn are allelomorphic. Perhaps the simplest explanation is that a crossover occurred between the factor and sn. However, other possibilities, such as mutation of sn to + and the presence of two sterility factors on the w^e sn chromosome, have not been eliminated.

Burla, Hans Key for species of Drosophila occurring in Switzerland.

1. Mesonotum yellow 2
- Mesonotum gray, every bristle arising from a dark spot. Repleta group 7
- Mesonotum brown or black 8

2. Yellow, small, slender. Three distinct brown or black longitudinal stripes on the mesonotum. The median stripe splits posteriorly. Black spots on the tergites of the abdomen .. busckii Coqu.
- Yellow, small, robust. Mesonotum without black stripes. Abdominal tergites with dark marginal bands not interrupted in the middle. Melanogaster group 3
- Small, yellow or brownish. Two presutural acrostichals on the mesonotum .... testacea v. Ros.
- Not entirely as above 4

3. Male genital arch with a small hook-like preocess .... melanogaster Meigen
- Male genital arch with a large clam-shell-like process .... simulans Sturtevant

4. A row of short peg-like bristles inside on the front femur .... immigrans Sturtevant
- No such bristles present 5

5. Abdominal tergites with blackish marginal bands which are interrupted in the middle; forming large triangular lateral spots .... histrio Meigen
- Abdominal marks different. Quinaria group 6

6. Yellow. Abdomen with dark marginal bands which are interrupted in the middle. Crossveins clouded.
Acrostichal hairs in 8 rows. Dark abdominal bands with straight anterior margins .... Kuntzei Duda
- Indistinct marginal bands widely interrupted in the middle and laterally narrowed. The first two oral bristles of about the same size .... limbata v. Ros.
- Marginal bands on the abdomen broken in four separate spots. Two prominent oral bristles .... transversa Fall.
- Marginal bands incomplete, broken into spots. Only one prominent oral bristle .... phalerata Meig.

7. 1st costal section apically blackened. Front coxae darkened on the apex. Costal index 3,0. Cheeks narrow .... repleta Wollast.
- Appex of first costal section blackened. Costal index 2.6. Broad cheeks .... buzzatti Patterson-Wheeler.
- Costal section not blackened. Costal index 3.4. Fore coxae light, males with long recurved hairs on medial side of fore tarsi .... hydei Sturtevant.

8. Large brown species. The marginal bands of the first two tergites in the middle indistinctly interrupted.
Arista with about 11 branches. The distal section of the 5th longitudinal vein of the wings shorter than the distal crossvein .... funebris Fabr.
Brown small species. Carina prominent only on the upper half of the face.
Sex-combs on first and second tarsal segments of male forelegs, each

consisting of only 2-4 bristles...................... *helvetica* Burla.
- Prescutellars present. Lowest part of the carina thickened. Victoria group 9
- Mesonotum brown with darker longitudinal stripes. Large species. Abdominal sternites relatively large and brownish. Crossveins clouded. Virilis group 10
- Blackish species. Two sex-combs on forelegs on males, consisting of 6-15 bristles. Obscura group 11

9. Brown, dull. Post-verticals crossed. Second orbital inserted outside of the first .... *guyénoti* Burla.
- Blackish, shining. Post-verticals convergent but not crossing. 2nd orbital inserted behind but not outside of the 1st orbital .... *nitens* Buzzati

10. Mesonotum yellowish brown, dull, with greyish-brown stripes .... *unimaculata* Strobl.
- Mesonotum darker, more polished .... *littoralis* Meig.

11. Mesonotum greyish brown. Pleurae and shoulders yellow. Sex-combs long, extended almost over the whole length of the first two tarsal joints .... *alpina* Burla.
- Not entirely as above 12

12. One terminal and one more proximal, equally long bristles on the palpi. Anterior apical part of the wings darkened in males ... . *tristis* Meig.
- 3rd costal section of the wings with heavy bristles on its basal half. Mesonotum uniformly dark, dull .... *subobscura* Collin.
- 3rd costal section with heavy bristles on its basal two-fifths .. 14

14. Mesonotum uniformly dark. The two first tarsal joints on males equally long .... *ambigua* Pomini.
- Mesonotum with two darker shining longitudinal stripes. Lateral yellow spots on the anterior margins of the 5th and the 6th tergites only in females .... *obscuroides* Pomini.
- Females without yellow spots on the tergites ..*bilineata* Pomini.

This key is preliminary. A more detailed one with descriptions and drawings will be published elsewhere later.

Buzzati-Traverso, A. Preference of *D. subobscura* for wild yeasts.

Flies have been set free in an empty room having on the floor a number of traps inseminated with yeasts isolated from free-living subobscura (DIS-22: 69) and with the usual baker's yeast. Experiments repeated several times have shown a definite preference of the flies for wild strains of yeasts. By making use of these strains, improvement in the breeding of this species has been obtained.

Buzzati-Traverso, A. (2) What is *Drosophila obscura?*

At least five European species correspond to Fallen's description (1823) of *D. obscura.* Material collected at Esperöd (Sweden) through the kind offices of Professor K. Anders (Lund) show the presence in the *terra typica* of *D. subobscura* and of *D. obscuroides.* Since *D. subobscura* is numerically prevalent at Esperöd, and has the wider geographical distribution in continental and insular Europe among species of the *obscura* group, it seems convenient to consider *D. subobscura* Collin 1936 as being *D. obscura*

Fallen 1823. Before making a formal statement on some publication according to international rules of zoological nomenclature, comments and criticisms on this proposition would be appreciated.

Castiglioni, M. C. An investigation has been begun on the histological structure of the eye in some white alleles and their compounds. Particular attention was paid to the distribution of the pigment granula. One preliminary result concerns the difference between the compounds of w^e, w^{bf}, w^{bl}, w^a with w, and those with w^i. The latter appear lighter than the former.

Gardner, Eldon J., and Stott, Gerald Genes producing a maternal effect on tumorous head found in "wild" populations of D. melanogaster. A maternal effect has been identified with an inherited abnormality characterized by abnormal growths in the hea region of D. melanogaster. A sex-link recessive gene controls the maternal effect, but acts only in the presence of a third-chromosome, semidominant, homozygous viable gene. A gene presumed to be an allele of the sex-linked ge controlling the maternal effect in the inbred tumorous-head stock was found i the Oregon-R stock. Another gene producing a more pronounced maternal effect than either the one in the inbred tumorous-head stock or that in the Oregon-R stock has been found in the Stephenville stock, recently obtained from the University of Texas. Nine other "wild" stocks and twenty-one laboratory muta stocks have been tested for the presence of factors controlling the maternal effect. All have given negative results.

Gloor, H. Silver-reducing organ in Drosophila larvae. On the ventral side of Drosophila larvae, near the posterior end, there a definite skin area that in a dilute silver nitrate solution stains selectively with silver. The structure in som what different shape is present in different species of Drosophila, but not i Calliphora larvae. It behaves like certain papillae of aquatic Dipteran larv which have been shown to be organs for osmotic regulation (salt uptake). Experiments are under way to check on this possibility for Drosophila.

Gowen, John W. Sex ratio genes. Continued inbreeding and homozygous matings have led to isolation of sever important sex genes. The action of one of these genes leads to sex ratios co parable with those so often observed in economic animal breeding. The sex ratios are variable from family to family. The sex ratio is affected by sele tion. Some matings give surprising results; others give ordinary sex ratios. These differences can appear even in families carrying the gene in homozygous condition, as shown in the following table (sex ratios for individual pair matings).

Pedigree No.	No. of Males	No. of Females	Pedigree No.	No. of Males	No. of Females
446 a.......	65	0	442 e.......	50	6
h.......	55	6	j.......	106	39
j.......	57	9	o.......	72	0
r.......	66	1	q.......	74	3
A.......	35	17	u.......	58	4
D.......	27	24	y.......	94	2

The sex ratios range from near equality in the sexes (No. 446D) to all males and no females (442-o). Male progeny are greatly in excess of female progeny. This is shown in the more extensive data. In twelve general crosses involving some hundreds of individual matings, the general result was 26,768 males to 5,110 females, a ratio of males to females of 5.2 to 1.0.

Reciprocal crosses showed that when the male carries the gene and the female does not, the sex ratio is practically one male to one female, or the sex inheritance of the male does not affect progeny sex ratio (321 males to 347 females). When the female carries the gene for the male ratio, the average ratio is 1.6 males to 1.0 females, a significant deviation from the normal 1:1. This deviation (1.6) is much less pronounced than when both parents carry the sex gene (5.2). This makes it appear as though both sexes had an effect on the sex ratio, even though the female alone shows it in the reciprocal matings.

When both parents are heterozygous, the progeny have the sex ratio 1139 males to 1004 females. When both sexes are heterozygous, the sex ratio is slightly toward an excess of male progeny, 113 males to 100 females. This ratio may be compared with 93 males to 100 females where the female parent is homozygous normal, and 162 males to 100 females where the mother is homozygous for the male sex gene. These results seem to indicate a gradation in the effects of the inheritance. The scale is +/+, 93; +/ms, 113; ms/ms, 162; or the heterozygote is about one-third up from the normal sex ratio. The puzzling fact is the high sex ratio of 520 males to 100 females when both sexes are ms/ms x ms/ms.

Tracing the inheritance through the different chromosomes shows that the gene, or genes, is located in the second chromosome, but as yet the position within this chromosome is unknown.

Hoch, Milton O. Displacement of f B^i B by wild-type in D. melanogaster.

A rapid displacement of flies bearing f B^i B factors on the X chromosome was observed when a wild-type male (WR+/+) was introduced into the f B^i B population. Ten f B^i B populations in 1/2-pint jars at 27°-30° C. were examined and transferred at 14-day intervals. The starting population consisted of 10 pairs of f B^i B and 1 WR+/+ male in each bottle. The initial frequency for f B^i B was .968, which reduced to .017 eighty-four days later, yielding a smooth curve of displacement meanwhile (data from 10,000 flies). f B^i B homozygotes were rare by the third census, so that the displacement that occurred was largely through the heterozygotes and f B^i B males. The males were more severely affected than the heterozygotes, as judged by their frequencies at each census. It is believed that the gene, forked, played little or no part in the displacement, and served merely as a marker to distinguish heterozygotes and homozygotes.

Other people here have observed displacement by wild-type in f B and f B^i populations. Their conditions were somewhat different, which makes comparison difficult, but it appears that displacement is faster in the f B^i B populations. Work is continuing, using larger populations at lower temperatures. Work is also being done to elucidate the causes of displacement.

Kikkawa, H. Tryptophane synthesis in insects.

According to recent work on Neurospora, it is stated that tryptophane is synthesized by the following processes: anthranilic acid ⟶ indole + serine ⟶ tryptophane. In order to find out whether or not insects are able to utilize anthranilic acid or indole as a precursor of tryptophane, I have injected anthranilic acid, indole with serine or without it into pupae of silkworms of normal or white-1 mutant type. If anthranilic acid or indole is utilized as a precursor of tryptophane in insects, the amount of + chromogen (hydroxykynurenine) or that of kynurenine in the pupae should increase as compared with the control (H_2O injection). But the result was negative. On one hand, indole-lactic acid is utilized by the silkworm. Similar results have been obtained in Drosophila. Assuming that the genes control enzyme functions or chemical reactions, the results seem to indicate that the gene-complex in insects is not the same as that of molds with respect to tryptophane synthesis Presumably the genes for converting anthranilic acid or indole into tryptophan have become inactive or lost in the course of evolution.

Lamy, R. Production of 2-X sperm in males

A stock of yellow attached-X females mated to white males was observed to produce occasional white females with two free X chromosomes and a Y. The frequency of the occurrence and its relation to the age of the white males was measured b mating 24 males individually to attached-X females and changing the pairs to fresh food two or three times a week throughout the life of the males. 32 white females were obtained in a total of 14,313 offspring. The regular F_1 males numbered 7587. Thus the over-all frequency with which the white chromosome showed equational doubling was .42%. The correlation of doubling with the age of the males was as follows: 1-14 days, .06%; 14-21 days, .34; 21-28 days, .52; 28-35 days, .83; and 35-38 days, 1.6.

All but four of the patroclinus females were mated to Muller-5 males and shown to contain two free X's and a Y. They gave about 1.5% of secondary nondisjunction. F_2 nondisjunctional females heterozygous for the white chromosom and M-5 gave, as expected, a much higher rate of secondary nondisjunction (33-50%). The only other known case of equational doubling of the X chromosome in males seems to be that reported by Schultz (Carnegie Inst. Wash. Year Book 33: 280, 1934) and attributed to the action of a particular gene. But Dr. Helen Slizynska reports finding patroclinus females in a stock of attached-X females mated to ring-chromosome males. This case has not been examined further.

Lefevre, George, Jr. Mutation in germinal and somatic tissue.

Wild-type Canton-S males were X-rayed in the larval stage with 1300 R, and 4700 adults were inspected for white eye-color mosaics. Examination of the adults immersed in paraffin oil permits a good separation of colorless mosaics from those possessing some color. Larvae were irradiated at 26, 48, and 70 hours after egg laying. From the incidence and average size of the white mosaics produced, a somatic mutation constant wa calculated. A value of about 14 x 10^{-6} was found in both the one- and two-day series, but a much lower value was computed from the data for the three-day series. In that case the size distribution was such that many undetectable mosaics less than one facet in size must have occurred. Data on germinal mutation of w^+ to w from various sources yield a value of 12.5 x 10^{-8} for the germinal mutation constant.

Attempts were made to induce reverse mutations of w in both germinal and somatic tissue. Adult y w sn^3 males were irradiated with 5000 r, and no evidence of reverse mutation was found in the 50,000 progeny examined. Irradiation of white larvae yielded no evidence of reverse somatic mutation of w in tests equivalent to the exposure of 600,000 loci to 5000 r. White alleles of three diverse origins were tested: spontaneous, X-ray-induced, and sulfur-mustard induced.

A comparison was made of the incidence of mosaics observed after the irradiation of larval w/+ females and +/sc^8 delta-49 w^a females. With a dcse of 1300 r, given at the rate of 59 r per minute, 48 hours after egg laying, a mosaic incidence of 65% per eye was observed in normal w/+ females, 6% per eye in the inversion heterozygotes, and about 2% per eye in + males. These results indicate that of the various mechanisms that might produce mosaics in heterozygous females, mutation, delection, chromosome loss, chromatid translocation, and abnormal segregation can be responsible for a relatively small proportion of the mosaics observed in normal females. Somatic crossing over or nonhomologous segmental interchange produce by far the majority of mosaics, but no clear evaluation can be made of the relative effectiveness of these latter two mechanisms.

Lewis, E. B. A "new" balancer for the third chromosome.

A derivative of the complex rearrangement T(2;3)Mé has been obtained from a T(2;3)Mé/ri stock. The complex of inversions in chromosome 3 is retained, but the insertion of the tip of 2R in heterochromatin of 3 is removed, probably as the result of double crossing over. This derivative-symbol, In(3LR)TM-carries Mé, ri, and as in T(2;3)Me, although not previously described, an inseparable sbd mutation (or position effect) such that TM/Sb is lethal and TM/sbd resembles sbd/sbd. It is at present used as a balancer for su^2-Hw (see this issue of DIS).

Lüers, H., and Borchert, R. Experiments on the induction of mutations by visible light.

Experiments have been undertaken with *D. melanogaster* to induce mutations by visible light after photosensitizing males with a photodynamic substance (Acridinorange). Use of Acridinorange has the advantage that this substance is relatively nontoxic for the flies and also penetrates the chromosomes. Males of a y w stock are fed on porcelain filters saturated with dilutions of Acridinorange and sugar for several days. After having taken up a demonstrable quantity, they are irradiated, at a controlled temperature, with wave length 4356 A, the sphere of highest absorption of the substance within the visible spectrum. With increasing doses (8.8×10^6 erg/cm^2 to 8.8×10^7 erg/cm^2), a rising percentage of males is killed (several hours to several days after irradiation) in contrast to controls that have only been fed with the photodynamic substance. First experiments have given a greater number of visible mutations in irradiated flies than in the controls.

Lüning, K. G. Gynandromorph production after mustard gas treatment.

In order to check the experiments by Bonnier and Lüning (see this section), a series of experiments was performed in which the flies were treated with sulfur mustard gas. In one of these, freshly hatched y w females and f males were treated together. The female progeny contained about 42,000 animals and gave 18 maternally and 20 paternally eliminated gynandromorphs. In a second experiment, in which freshly hatched w sn females were treated and crossed to freshly hatched y f car males, about 22,000 female progeny were counted. These included 18 gynandromorphs, of which 15 were due to maternal and only 3 to paternal elimination. Finally, one experiment in which freshly hatched wild males were treated and then mated to y w sn females has given a female progeny of about 30,000. As there are no marker genes in the males, only paternal eliminations can be checked. So far they amount to 31.

Luria, Z., Valencia, J. I., and Muller, H.J. Simultaneous induction of chromatid and chromosome rearrangements of the same chromosome.

Among the F_1 of a cross of X-rayed sc.Y^L/sc w.B.Y^s males by y In 49 v f; bw females, a mosaic female was found by Z. Luria which was narrow B in one eye and + in the other, with forked bristles present unilaterally on the same side as the + eye. The female proved fertile, giving offspring which showed that the mosaicism had included her gonads. The progeny were of the type expected if two different females had been used, one of composition sc w BB. Y^s/y v f . Y^s bw and one of composition sc w (f B)$^-$.Y^s/ y v f .Y^s bw. In other words, the irradiated X of one part of the mosaic was nonlethal, nonsterilizing, and phenotypically like double Bar, whereas that of the other part behaved as if it had a small deletion of the region containing forked and Bar, being lethal in the male but viable in the heterozygous female.

Salivary study of both types of X's by Valencia, showed that the (f B)$^-$ chromosome has a deficiency extending from 16A3 or -4 to 16F4 or -5, and that the piece missing here is present as a duplication in the chromosome, giving the double Bar phenotype. (Thus the latter has the Bar region quadruply represented.) At the same time, an inversion has taken place, and is present in both the deficient and duplicated chromosome alike, This inversion extends from about 1-B5, a point well to the left of the deficiency or duplication and lying between the loci of fw and wy, to about 20A2, a point in the chromocentral heterochromatic region, to the left of the centromere. Thus it is larger in extent, and more extreme in effect on crossing over, than the B^{M1} and B^{M2} inversions, and it includes, without touching them, the BB duplication and the deficiency.

The apparent identity of position of all the breaks in the two original chromatids, along with the fact that the union of fragments was in part the same and in part different in the two (as has also been found by Valencia in studying the progeny of other mosaics produced by irradiation of spermatozoa) appears to indicate that breakage occurred at a stage when the chromosome was in effect single, but tho union, of some of the pieces at any rate, at a stage when it consisted of two separate chromatids. It is noteworthy that chromosome rearrangements occurred on both sides of the chromatid rearrangements.

The sc w BB^L, Inh. Y^s chromosome, as we designate it, should be a useful one in several ways. For one thing, since it overlaps In49, chromosomes differing in both of these inversions should give even less crossing over than the In49 B^{M1} or In49 B^{M2} heterozygous combinations. For another thing, the Y^s arm should be less readily detachable than usual by crossing over with a Y or between X chromosomes of identical type, because of the fact that there is a shorter stretch of X heterochromatin homologous with that of a Y^s or Y^L present just to the left of the centromere. This chromosome should therefore provide more stable stocks when in combination with chromosomes of the Y^L and sc . Y^1 types. We now have it in males in a stock with sc . Y^L, the females having y f : = attached X's. Females homozygous for the BB^L were found able to breed, but rather small, weak, and infertile, as is usual with high multiples of Bar.

We designate the deficient chromosome sc w (f B)$^{-L}$, Inh.Y^s, and have this balanced over sc^{S1} f In49. v.

Makino, Sajiro The geographic variation of some species of Drosophila in Hokkaido. A survey of the geographic distribution of Drosophila in Hokkaido has been made in our Laboratory with the assistance of Mr. T. Mizuno, a student. Wild stocks of *D. melanogaster*, *virilis*, *immigrans*, and *nigromaculata* collected this summer in several localities of Hokkaido have been bred for the purpose of investigating the geographic variation of the chromosome structure. The survey of the geographic distribution will be extended over various areas of the island of Hokkaido in the future.

Mickey, George H. Association of species in an ecological niche. Several adult flies were seen to emerge from a small hole in a tomato which was still attached to a vine in my garden but which was beginning to ferment. Larvae collected from this one tomato were reared in the laboratory, and yielded four species of Drosophila as follows: *D. subquinaria*, *D. simulans*, *D. buskii*, and *D. tripunctata*. Stocks of these species are being maintained, except for the first, which was lost.

Moree, Ray. Call for genes with incomplete dominance. I should like to obtain stocks (either sex-linked or autosomal) either incompletely dominant or incompletely recessive to wild-type *D. melanogaster*, to be used in experimental population work, provided of course that holders of such stocks do not already plan to use them for the same purpose.

Nakamura, K. and Imaizumi, T. Electric charge at the surface of developing embryos (*D. virilis*) was measured in liquid paraffin. It was found that embryos bear a positive charge in liquid paraffin, and that the charge changes as developmental stages proceed. Through stages in which polar cells appear at the posterior end of the embryo and the blastoderm is formed, the electric charge at the surface increases gradually, and then decreases to the former level at later stages. When killed with heat, embryos at each stage do not show such differences in surface charge.

Newby, W. W. Morphological studies on the tumorous-head stock. Morphological studies on the development of the head through the larval and pupal stages have been carried out in the tumorous-head stock. Abnormalities of the head primordia may easily be recognized in the late larval stages, and probably even earlier.

Novitski, E. An inversion of the entire X chromosome. In the F_1 of females presumed to be of the constitution X^c, y/sc cv v f, no single crossovers were found, as is expected of ring-X heterozygotes; but the doubles involving the "ring" were as frequent as those involving the rod X, and not about a third as frequent, as is expected with such heterozygotes. It was suspected that the ring-X had opened out, as had been previously observed by L.V. Morgan, but that in this case the opening had occurred in reverse order, to produce a long inversion with yellow at the base. Tests of the composition

$(X^c, y)?/In(1)sc^8, sc^8$ cv v f ♀♀ x y sc cv v f B ♂♂ showed that this was the case, since in such heterozygotes single crossing over occurred with normal frequency and one of the crossover classes was inviable in the male but viable as a yellow deficiency in the female.

It is possible that the new inversion arose by crossing over with the Y, which supplied two ends to the ring-X. Males carrying the opened ring and either Y^L or Y^S separately are sterile, so that neither an entire Y^S nor Y^L is attached to the X. However, when the single crossover product from $(X^c, y)?/In(1)sc^8, sc^8$ cv v f carrying the base of sc^8 and the tip of $(X^c, y)?$ is combined with $bb^{\underline{1}}$, a bb phenotype results. This can be explained by either (1) the possession of a bb allele in the original ring stock, which was suppressed by a normal allele in the duplicate heterochromatic region carried by the ring and which was shifted to the longer free end when the ring opened out, or (2) the attachment of the end of Y^L, including that section which carries a bb allele, to the new free end of the X chromosome.

In neuroblast metaphases the chromosome appears to be a normal X plus a short arm about one-fourth the length of the longer arm of the X.

Since the entire X chromosome appears to be inverted, the inversion has been given the symbol In(1)EN.

Oftedal, Per. Analysis of a fore-and-aft gynandromorph. This summer a gynandromorph of the fore-and-aft type was found in a sn^2 B & yy stock, at the Genetics Institute, the University of Oslo, Norway. Description: Head entirely male, with singed bristles and hairs. Both eyes Bar--the right of the normal homozygous Bar type, the left also Bar, but with a rather large area (B) of Sturtevant (Sturtevant, 1927), containing ommatidia, and a smaller area along the upper anterior margin of area (B) also composed of ommatidia. Thorax: All hairs and bristles singed, except those contained in a wedge including the right half posterior margin of the thorax, and extending anteriorly two-thirds of the length of the thorax--namely, both right scutellars, right posterior dorsocentral, both right postalars, and the posterior two-thirds of the dextral median and submedian rows of acrosticals. Appendages: Both fore legs have sex-combs of normal size. Both wings and all legs are singed. The right wing is slightly warped. Abdomen: Yellow; all hairs non-singed; external genitalia entirely female and normal.

The gynandromorph was confined with sn^2 B males. The males repeatedly attempted to mate with the gynandromorph. Usually the gynandromorph did not permit mounting, and under observation always decamped before copulation was completed. At least one attempt must have been successful, however, since one of the several eggs laid hatched. This larva did not pupate, and so no progeny was obtained. The gynandromorph was probably due to a binucleate egg, fertilized by two different sperms. The nucleus giving rise to the anterior, male part must have contained a Y chromosome, and must have been fertilized by a sperm carrying a sn^2 B X chromosome. The nucleus giving rise to the posterior, female part must have contained yy, fertilized by a Y-carrying sperm. Fertilization by an X-carrying sperm would have made the abdomen non-yellow.

Oshima, C. Hybrids between *D. novamexicana* and *D. virilis*. Patterson, Stone, and Griffen (1942) reported that the hybrid female from *D. virilis* ♀ x *D. novamexicana* ♂ was fertile, but the hybrid male sterile. In the course of my experiment on *D. novamexicana* ♀ x *D. virilis* ♂, one hybrid male was obtained that was fertile when crossed with *virilis* females. The first back-cross females were crossed with *virilis* males, and this was repeated three times. When the mutant genes, yellow (2.9) and apricot (130.6), were given to the X chromosome of *virilis*, the males that had X^v (*virilis*'s X) were distinguished from the males that had X^n (*novamexicana*'s X), as well as from the males that had X^{v-n} (*novamexicana* and *virilis* compound); the case of the females was the same. The compound X came out of the crossing over in the distal part of X chromosome but not in the overlapping inversions which were the same with that of *D. americana*.

X^nX^v ♀ (y-ap/+) x *virilis* ♂ (y-ap)

	F1 Female				Male				Female	Male
	(y-ap)	(ap)	(y)	(+)	(y-ap)	(ap)	(y)	(+)	$\frac{(y)+(+)}{(y\text{-}ap)+(ap)}$	$\frac{(y)+(+)}{(y\text{-}ap)+(ap)}$
Backcross										
2nd	160	77	64	176	144	62	45	93	1.01	0.67
3rd	311	167	166	365	329	161	99	192	1.11	0.59
4th	203	95	102	242	194	98	57	92	1.15	0.51

The number of *virilis* autosomes would increase as the backcross was repeated, although it was statistically proved by the chi-square method that genic complementary relation between the two kinds of sex chromosomes was not effected by the autosomes. (D.F.= 6. ♀:chi-square = 3.7404; 0.80 > P > 0.70. ♂:chi-square = 5.2894; 0.70 > P > 0.50.) From the results shown in the table, it was found that the homozygous males (X^vY^v) were superior in vitality and fertility to the heterozygous males (X^nY^v). When (V(NV))V females were crossed with *novamexicana* males, 40 males (X^vY^n) and 54 males (X^nY^n) (Y^n: *novamexicana*'s Y) were obtained, and the latter were superior in fertility to the former. In short, the backcrossed males that had the sex chromosomes of the same species were always superior in vitality and fertility to those that had the sex chromosomes of the different species. It seems that the X and Y chromosomes have the complementary genes that make the *virilis-novamexicana* hybrid males fertile as the *virilis-americana* hybrid males. This genic complementary relation, and the Y-autosomes relation which Patterson, Stone, and Griffen discovered, will control the fertility and vitality of the hybrid males from the virilis group's members.

The *D. novamexicana* strain (1714.4) was received from Professor J. T. Patterson, of the University of Texas, by the hand of Dr. M. Kodani in A.B.C.C. in Hiroshima. I should like to express here my appreciation.

Piternick, Leonie K. Reverse mutations in D. melanogaster. *D. melanogaster* males were irradiated (2400-6000 r X-rays) in an attempt to produce reverse mutations. The following stocks were tested:

Stock	Number of Flies Examined
y^2 cv v f	1411
ec ct g^2	818
w	12260
w sn	19971
$In(1)y^{px\ bl}$,In(1)w	1973
$In(1)y^{px\ bl}$,In(1)w,f	24448

All the "reversions" found occurred in the stock $In(1)y^{px\ bl}$, In(1)w,f, and w observed for f only: 23 partial reversions (i.e., phenotypic expression of f less extreme than in the parent flies); 8 "reversions" (bristles straight, bu either slightly bb, or one or two bristles missing, or both characters combined). All flies with partial and complete reversions were tested. In the offspring, f appeared in a number of types of expression, but in no case coul a line with normal bristles be isolated.

Power, Maxwell E. A report from a study of the correlation between flightless behavior and the central nervous system of D. melanogaster. A neurological study is being made of nine mutant strains of D. melanogaster in order to determine the relationship between an aberrant behavior pattern and the central nervous system. The following stocks, which will not fly, were arbitrarily chosen for study: bi ct^6 g^2; al b c sp^2; Df(2) vg^B/Cy, L^4 sp^2; Ly/D^3; ru h th st cu sr e^s ca; ss^a; bx^{34e}/Payne, Dfd ca; tx; and Gl Sb/LVM-3L Payne. It is generally assume that these stocks do not exhibit the normal flight reflex because of their respective possession of the following genes: cut, curved, Curly, Lyra, curl aristapedia, bithorax, taxi, and Stubble; but this has not been clearly demonstrated in all cases. The material is being studied in silver- and gold-impregnated sections. The investigation has so far failed to reveal any detectable changes in the morphology of the central nervous system that can b correlated with the absence of flight. The known cortical neurons are presen the fiber pathways and glomeruli appear normally developed in the neuropile, and the pair of giant fibers seems not to be modified in any of the mutant lines. Because flight is a thoracic activity, volumetric measurements were made on the thoracico-abdominal nervous system; but these quantitative studie likewise failed to demonstrate any significant differences between the contro and the experimentals in respect to the volume of the entire thoracico-abdominal nerve mass, that of the cortex, or that of the neuropile. It would thu appear that, unlike alterations in peripheral sensory fields, these genetic deviations in motor behavioral expression are not associated with identifiabl aberrations in the central nervous system. No attention has been given to physiology, musculature, skeleton, or the peripheral nerves.

Rosin, S. Chemically induced disturbance of bristle pattern. Injection of nitrogen mustard into old larvae of D. melanogaster suppresses th development of the bristles in varying degrees. Different regions of head and thorax react in a specific manner. Eyes, wings, legs, and abdominal differentiation are often also abnormal. Th analysis of the pattern of disturbance is still in progress.

Semenza, L. A series of new mutants of D. melanogaster acting on wing are under investigation in order to determine the interaction during phenogenesis.

Sobels, F. H. Normal egg production of lethal ovaries after transplantation into normal hosts.

Ovaries of larvae homozygous for the gene lethal-translucida (ltr, 3-21±) were transplanted into female fes cn bw/fes cn bw larvae. In those cases where attachment of the implanted ovaries to the oviduct of the host took place, the sterile females, after mating with cn bw/cn bw males, gave normal offspring, which could be recognized genetically as originating from the lethal-translucida ovaries.

Spurway, H. A lethal allele of ct producing a high frequency of back-mutation in nonlethal alleles at the same locus.

Dr. R. Milani, while at University College, London, discovered in *D. subobscura* what behaved genetically as a deficiency for the cut locus i.e., a sex-linked lethal which when heterozygous with a ct allele produced females with a phenotype intermediate between the homozygous females and the hemizygous males. (There is great sexual dimorphism in most ct alleles in *subobscura*; only in one is the female fully penetrant, and in many the phenotype is entirely confined to the males.) He was unable to find any cytological abnormality.

Females heterozygous for this lethal and at least three other ct allelomorphs produce, as expected, twice as many daughters as sons; but those sons, instead of being entirely ct, contain among themselves 1.7% wild-type flies. These exceptional males and their descendants breed consistently as though they carried a ct^+ allele. Experiments with bnt, 4.5 units from ct, seem to show that it is the nonlethal allele which mutates to wild-type; but this is not critical, as the absence of markers closely straddling the ct locus makes it impossible to observe whether some unequal crossing over has occurred in this region.

The ct locus seems to be the most mutable in this species, in both directions, and there are several anomalies in both this mutation rate and the actual penetrance of the alleles, which seem to be connected with different chromosome orders. On the evidence of the complex pleiotropisms of the phenotypes of the many alleles, the homology of this locus with its namesake in *melanogaster* seems better established than most.

Sturtevant, A. H. Sequence of loci near the centromere of chromosome 2.

A series of multiple-mutant stocks has been made up (e.g., stw^{48} blt tuf, pk tuf, tuf ltd). The techniques used in making these gave information on the sequences involved, and they have also been used to make further tests on other loci. In addition a series of deficiencies has been tested against the mutants of this region. One of these is the crossover between bw^{VDe2} and In(2R)Cy; this and the duplication from T(2;3)108 both give evidence (consistent in all cases) on the position of the left break point of the Cy(R) inversion in the genetic map--and this break point is already known to lie between salivary bands 42A2 and 42A3. The sequence of loci is as follows: Bl, lt, centromere, rl, stw, blt, In(2R)Cy left break point, pk, tuf, ltd. The total crossing over for this region is not far from 1%.

Suley, A. C. E. Transplantation experiments with the mutant grandchildless (Chr. 3) in *D. subobscura*.

gs/gs females produce sterile offspring, with reduced ovaries or testes, regardless of the males to which they are mated (Spurway, DIS-20). Transplants of gonad rudiments between larvae from fertile and sterile families, at third instar, show that both types of gonad are capable of autonomous development from this stage (Suley and Milani, DIS-22) and appear unaffected by the host. Sterile individuals with ovaries transplanted from fertile ones are capable of bearing foster children. (The true relationship of these was checked by the use of genetical markers.) About one-half of the "sterile" foster mothers were known to be gs/gs themselves, as well as being the daughters of gs/gs mothers. But they did not appear to exercise the sterilizing effect on their foster children that a gs/gs female exerts on her own children. (Sixteen foster mothers produced nt offspring with no genital abnormality. Sixteen nt/nt mothers, as controls, also produced normal broods with the exception of one sterile male. Fifteen foster mothers produced ma int offspring, 1% of which were sterile; but ma int controls showed that a comparable proportion was present in the ma int stock.)

Valencia, R. M., Muller, H. J., and Valencia, J.I. Formation of attached X's by reverse crossing over in the heterochromatic region.

In the course of an experiment in which the oogonia of females of our "plond" stock (bl23 in DIS-22) were irradiated, it was noted that attached X's were formed with an unusually high frequency. The daughters containing them were always dark yellow, and frequently were also car, f car, or narrow B. The frequency of these attached-X daughters was about 1 in 250 following 4200 r.

The "plond" mothers regularly contain sc^{S1} B In49 lz^s in one X chromosome and a series of recessive mutations called "ploc" (y ac sc pn w rb cm ct^6 sn^3 oc ras^2 v dy g f car) in the other. In addition they contain a Y chromosome of the $sc.Y^L$ type, marked with a dark yellow, and called $y^3.Y^L$. The males of the "plond" stock, which were used as fathers in this experiment, also have a $y^3.Y^L$, and their X is of composition y oc $lz^3.Y^S$.

Analysis of the situation led to the following conclusions. The heterochromatic section lying near the distal end of the sc^{S1} chromosome occasionally crosses over, in reverse arrangement (as it does with a Y when chromosomes of $sc.Y^L$ type arise), with the heterochromatin just to the left of the centromere in the "ploc" X chromosome. (See figure 1.) When this occurs, the result is attached X's, with the y^+ ac^+ sc^{S1}-containing region missing from the sc^{S1} chromosome. However, the $y^3.Y^L$ which the daughters receive from their father makes them diploid for the loci in this region. Such females appear dark yellow. It is to be noted that, unlike ordinary attached X's, these have a nearly terminal centromere but that, except for In49, their genes are in mirror-image order to one another, as they are in ordinary attached X's. Therefore, by folding of the heterochromatic bridge, alignment of all parts except the In49 region can occur.

After this attachment has taken place, then, the homologous regions at either side of the point at which the chromosomes have become attached to one another find and pair with one another in the oocyte stage, as shown in figure 2. Double crossing over can then occur fairly readily in this region, especially after irradiation, and when both crossings over involve the same two strands, strands unconnected with one another across their centromere, the result is attached X's homozygous for car, f car, or B. Although such double crossing over can also occur between the detached X's of ordinary females of the "plond" stock, and would then also produce car, f car, or BB exceptions, which however would be non-yellow, such non-yellow exceptions appear with very much greater rarity, even after irradiation, than the corresponding dark-yellow exceptions resulting from double crossing over between the attached X's. This shows that the fact of their attachment to one another leads to much more complete synapsis of the regions in question (roughly extending from the loci of g to bb) than usually occurs between the same regions of these chromosomes when they are detached. This must be largely because the synapsis of the detached chromosomes, even in these regions, is much hindered by the heterozygous Inversion 49, which introduces competitive pairing of other parts. It must be concluded that the attachment, allowing the g-bb region of both chromosomes to be adjacent to one another from the start, and thus initiating a zipper action, succeeds in largely overcoming the interference which In49 would otherwise exert.

In view of the above analysis, it seems probable that the so-called double attached X chromosome described in DIS-17, pp. 61-62, and DIS-18, p. 57, which has given rise to our "y f:=" stocks, arose by the above method, rather than by deletion and double attachment as described, although the structure arrived at would be the same in either case and was correctly given. This chromosome also was originally heterozygous for f and B (in "repulsion" arrangement) and the homozygosity in regard to f arose through a later double crossing over, of the type described above.

Several attached-X stocks produced in this way later began to produce occasional disjunctional progeny again. This can be accounted for on the interpretation that here another heterochromatic crossing over had followed the first, the later one involving an exchange between the heterochromatic bridge that unites the X chromosomes, on the one hand, and the y^3 .$Y^{\underline{1}}$ chromosome, on the other hand, as shown in figure.3. Thus the attached X's become separated again and the region previously lost from the sc^{S1} chromosome resupplied, though in this case with a dark-yellow marker. At the same time, the "plec" chromosome would receive a centromere and a $Y^{\underline{1}}$ "tail" to the right of the centromere. It is to be noted, however, that our "y f:=" chromosome, unlike some of the recently induced double X's described above, has been observed to undergo such detachment only with extreme rarity, and far less often than the ordinary attached X's with median centromere, at least when an ordinary Y is present.

(For figures see next two pages).

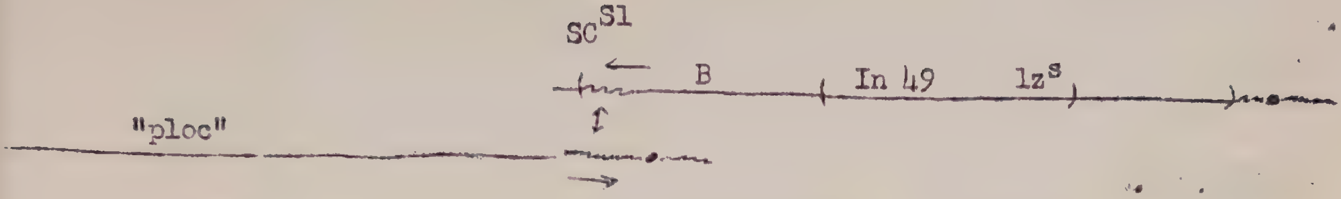


Figure 1

Formation of double X by reversed crossing over. Wavy lines represent heterochromatic regions; single arrows indicate the orientation which a given heterochromatic region would have towards the centromere if it were located in a chromosome of normal structure. The large dot represents the centromere as here placed; a double arrow marks the point of crossing over. It will be seen that only when crossing over involves reversed arrangement of parts at attachment point are monocentric (but double sized) chromosomes formed.

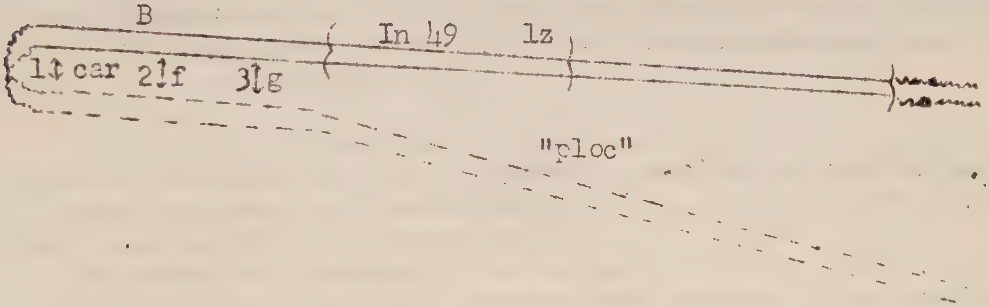


Figure 2

Double crossing over in attached X, giving rise to homozygous car, f car, or B. Points of crossing over are indicated by arrows. Note that the two strands involved must be unconnected. Crossing over at 1 and 3 would produce f car, and crossing over at 1 and 2 would produce car. The corresponding class in both cases would be B/B. Since no homozygous forkeds occurred, 2 and 3 must be too close together for double crossing over.

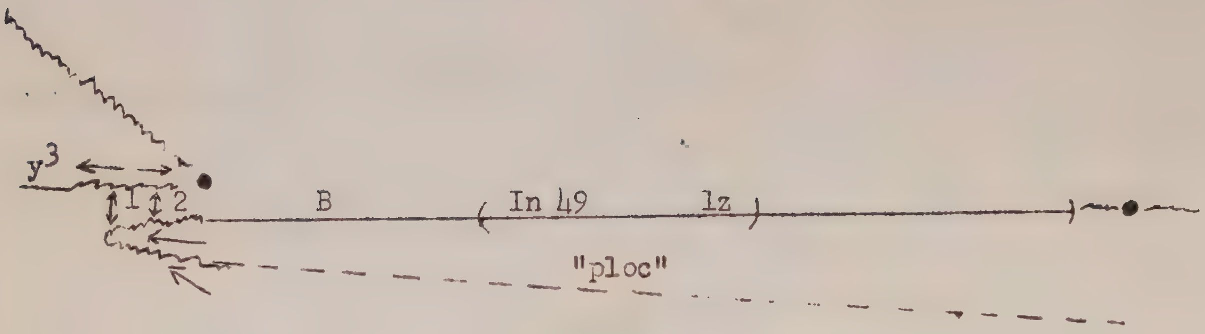


Figure 3

Detachment of double X by crossing over with $y^3 .Y^L$. Symbols same as in figure 1. The region of the $y^3 .Y^L$ chromosome at 2 is derived from an original Y, and so has normal orientation, whereas the region of $y^3 .Y^L$ at 1 is derived from heterochromatin of a sc^{S1} X and is in inverted position with regard to centromere. Therefore if crossing over is at 2, it must be "reverse" in order so as to give monocentric chromosomes, but if it is at 1 it is of orthodox (nonreverse) type. On the other hand, the Y could as well cross over with the part of the heterochromatin shown below (that derived from the "ploc" chromosome), and in this case crossing over at 2 must be orthodox and that at 1 reverse, to give monocentrics.

Wallace, Bruce. Effects of radiations on populations

Recently we have started a program to determine the genetic effects of radiations on populations. The analyses will include a study of frequencies of dominant and recessive lethal gene mutations, chromosomal aberrations, and sterility genes in populations treated chronically or acutely with gamma or X-rays. So far, data are avilable only for the elimination of dominant lethals from populations; obtaining data for recessive lethals is much more time-consuming.

Three populations of D. melanogaster are being maintained. (For description of population cages, see Technical Notes.) Each of these populations was started with 16 strains (isolated from a mass culture of Ore-R) isogenic for their second chromosomes and free of lethal or semilethal genes on that chromosome. The flies used to start population #1 (3933) flies) were exposed to the following amounts of X-ray; males, 7125 r units; females, 1012.5 r units. Both males and females (total of 4219 flies) used to start population #2 were exposed to 1012.5 r units. The flies of population #3 (total of 2114) were untreated.

Egg samples (1000 or more eggs per sample per cage) have been taken from these populations every two weeks, starting the day after the original flies were first placed in their cages. The sampling procedure for dominant lehtals consists of inserting a food cup into a cage for approximately 6 hours. Eggs deposited on the food in this period are transferred to food on a glass slide; usually 50 eggs are placed on each slide. These slides are then placed in shell vials, the vials are covered with moist toweling, and trays of vials are placed in a constant-temperature room (25° ± 1°). The unhatched eggs are counted after 24 hours and are transferred to fresh slides; a second and final count is made at 48 hours. The data that have been obtained are presented below (percentage of eggs unhatched after 48 hours):

	Population			Probability that data from 3 cages are homogeneous
	#1	#2	#3	
Sample 1 (parents)	96.6	58.3	17.3	0
2	52.3	39.4	28.1	0
3	13.5	7.8	8.8	0+
4	13.1	10.1	8.0	.001
5	7.6	7.5	5.6	.14
6	8.2	11.8	8.6	.01
7	9.5	16.8	8.2	.0+

Obviously, the bulk of the dominant lethals are eliminated at once, as expected. The high frequency of unhatched eggs of sample 2 merely indicates that the survivors of the original parents comprise most of the population, despite the emergence of the new generation. However, genetic conditions--presumably translocations and pericentric inversions--capable of giving rise to dominant-lethal combinations persist through the third and fourth samples (second and third generations). The heterogeneity of the sixth and seventh samples is, as yet, unexplained.

The frequencies of unhatched eggs in the control population (#3) demonstrate the effect of heterosis. The original strains of flies, isogenic for their second chromosomes, were chosen for the absence of genes deleterious to viability. Apparently, however, these flies were homozygous for fertility modifiers, and produced eggs of poor hatching quality. Sample 2 of cage #3 shows the effects of age on these same flies, but subsequent samples show a marked decrease in the frequency of unhatched eggs. This decrease probably results from random mating between the isogenic strains and the production of flies heterozygous for their second chromosomes. The increase in frequency of egg hatching is greater than is apparent, for the original flies were raised under reasonably good conditions in culture bottles, whereas the subsequent generations developed under the stringent conditions existing in population-cage food cups--conditions that should lower the percentage of hatching.

Wilson, Louise Palmer. The use of N-phenyl nile blue choride as a vital stain for fat in Drosophila.

N-phenyl nile blue chloride obtained from Calco Chemical Company was added to a sterile culture medium to which sterile eggs of *D. melanogaster* were added. Under these conditions cells of the fat body show bright-red droplets of neutral fat as the larvae develope. Parts of the gut show varying shades of blue and purple. Tumor cells in the fat body are not stained, or are faintly tinted, and it is thus possible to identify early premelanotic stages of tumors in the living larvae. The larvae grow and develop normally in a concentration of 0.002% of the dye. The use of this dye should facilitate study of the development of tumors as well as be useful in the study of general anatomical problems.

Yu, Sien-chiue. Studies of reverse mutations of several recessives in *D. melanogaster.* X-ray-induced reverse mutations were looked for among the progeny of y sc w^e spl females mated to treated sc^7 w^a males (4500 r units). One apparent reversion of sc^7 was sterile, and no reversals of w^a were found among 7106 gametes tested. From a mating of y ac v; bw females and treated v; bw males (4500 r units), no v reversals were found among 6050 gametes tested. From cn px bw sp females mated to treated cn bw males (4500 r units), no cn reversals occurred among 14,432 gametes tested. From bw; th st cp females mated to treated px bw sp; st males (4500), no st reversals occurred among 29,195 gametes tested. No reversals of bw were detected in these experiments among a total of 55,723 gametes tested.

TECHNICAL NOTES

Begg, Michael, and Robertson, Forbes W. Aseptic culture of Drosophila. Eggs are collected and transferred to a test tube containing sterile water, which is rotated about its long axis for several minutes, after which the eggs are allowed to settle. The water is then replaced by 50% ethyl alcohol. The tube is again rotated slowly for 3-4 minutes, and the eggs are allowed to collect at the bottom of the tube, then removed with a sterile pipette and transferred to a tube containing 5% antiformin in 10% formaldehyde solution (Glaser, 1943). After 10 minutes they are removed to another tube of 50% alcohol, and after settling are transferred in batches of about 20 tosmall round-bottomed tubes (3/8" x 2"), containing 50% alcohol. Two further changes are made into similar tubes, so that the total immersion time at this stage is about 25 minutes. The eggs are then transferred, with the usual precautions, to the sterile culture media. This is best carried out by using pipettes made by drawing out glass tube, squaring the ends off very carefully, and plugging with cotton wool. With the aid of a length of rubber tubing attached to the top of the pipette, the operator can suck the eggs into the end of the pipette and gently blow out excess alcohol, while holding the pipette against the glass bottom to prevent the eggs from escaping. The entire operation can be carried out by one person after practice, but at first it is safer for two persons to work together.

Latteraly a modification was used, involving transference of eggs, after immersion in antiformin and formaldehyde, to a small sterile glass tube close at one end by a platinum grid (100 mesh per square inch); the eggs can then be moved from one solution to another in this container. After 10 minutes in a mercuric chloride solution of the following composition:

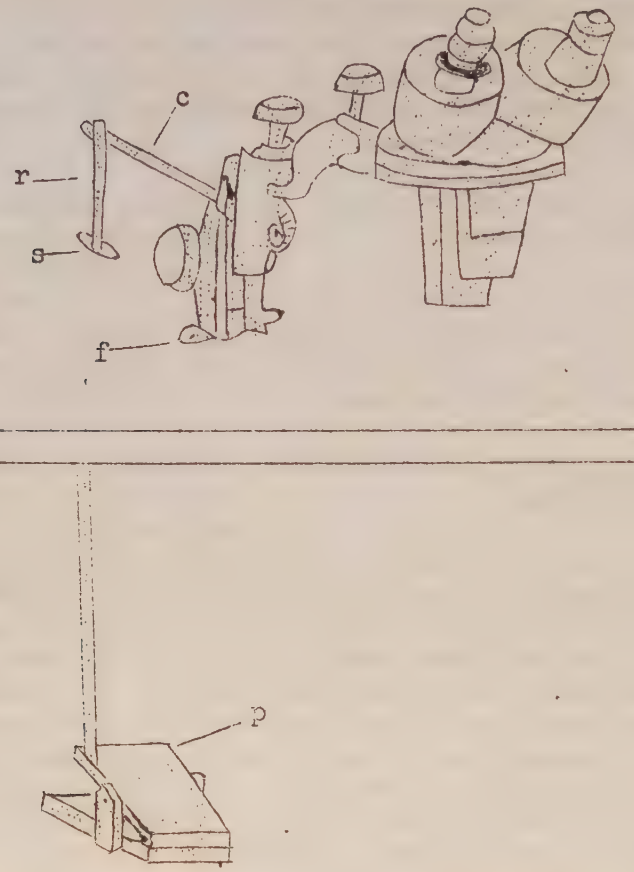
HgCl2	0.50 g.
HCl	1.25 ml.
NaCl	6.5 g.
Ethyl alcohol	250 ml.
Water to	1 litre,

the eggs are given four 5-minute washes in alcohol. Finally the eggs are removed in batches to the small tubes, and thence into the cultures without further transfers.

Mickey, George H. Cellucotton in cultures. Routine use of cellucotton in culture vials and bottles (as indicated in 194 J. N.Y. Ent. Soc. 49: 77-84) has consistently yielded larger numbers of flies than the use of paper toweling or other materials. We have found that the best method of applying the cellucotton to vials is to cool the food on a slant in such a way that one edge of the surface is near the bottom of the vial. Then a small bit of sterile cellucotton is inserted at the shallow margin. Fermentation gases can escape without "blowing up" the food.

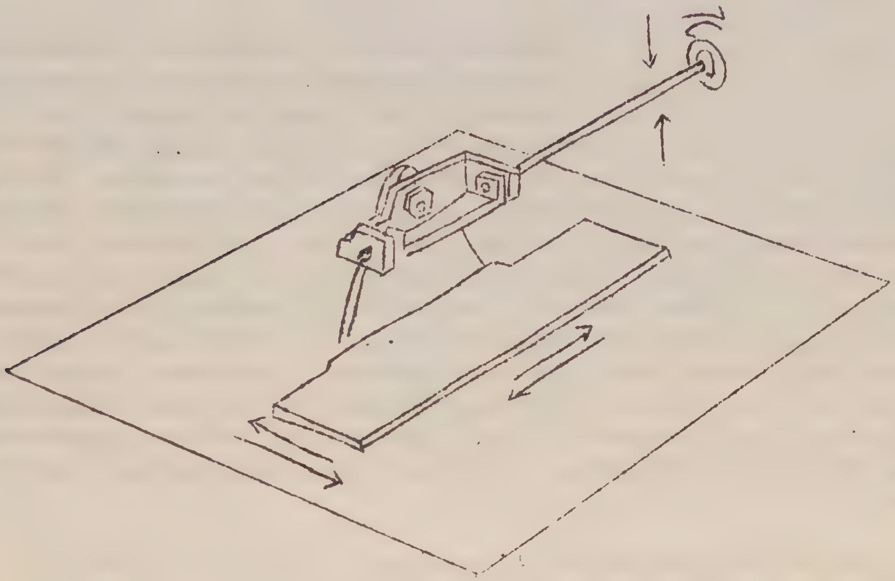
Mickey, George H. (2) Water table for controlling temperature. A fairly uniform temperature can be maintained for stock cultures and for class experiments by placing cultures in metal containers and putting the latter in a water table. The rate of flo of tap water will regulate the temperature within a narrow range. Aluminum baking or loaf pans, 9 5/8 x 5 1/2 x 2 3/4 inches, weighted with a rectangle of sheet lead cut to fit the bottom, have been found to be suitable container

Mickey, George H. (3) Foot-focusing device for binocular. The need is acute for a means of focusing the binocular dissecting microscope for work where both hands are needed for dissection under high manification. The design described herein is much simpler than that reported by Stern (DIS-6, 1936), and can be constructed from materials available in any laboratory. The Bausch and Lomb model RKT-5 and the American Optical Company's Spencer model 28 LG are suitab types of instruments. The binocular is placed at about a 30-degree angle fro the edge of the table and is screwed to the table top by means of a metal flange (f); a laboratory extention clamp (c) is attached to the focusing knob A hole bored through the opposite end of the clamp allows fastening the clamp to a rod (r) by means of a small bolt. The rod passes through a slit (s) in the table top to join the pedal (p) below. The clamp can be attached to or removed from the focusing adjustment quickly, to allow for hand operation or for adjustment to a greater range of focus. (See accompanying sketch on following page).



Newby, W. W. Sectioning of Drosophila. When sectioning Drosophila, it has been found that clearing with several changes of chloroform instead of xylene gives consistently better results. Serial sections may be cut at 6 micra by the use of a safety razor blade, in such a way that about one-half millimeter of the razor blade's edge projects above the edge of the microtome blade. This method of sectioning, originally observed in the Texas laboratory, has proved invaluable in sectioning larvae, pupae, and imagoes.

Reeve, Erick, and Robertson, Forbes W. Measurement of living Drosophila. In carrying out selection for body size in D. melanogaster, we had to devise a method of measuring the body size of live flies rapidly and accurately. We have used a small movable platform (see figure), which is attached to the moving stage of an ordinary microscope, and can be rotated about either of two horizontal axes at right angles to each other by twisting or moving vertically an attached lever. The platform is covered with thin cloth, to which the etherized fly readily adheres. The fly is placed on the platform in approximately the correct position, and the dimension required can be brought into the exact position and alignment for measuring with a calibrated ocular micrometer, by use of the moving stage and platform adjustments, and by rotating the axis of the micrometer. By this method it is possible for a skilled operator to measure 150-200 flies i day before fatigue ruins the accuracy of measurement. Provided that the two ends of the dimension to be measured are brought into focus simultaneously, accuracy is limited in practice only by the degree of definition of the two end points.



Smith, Guinevere C. A substitute for Moldex.

Since "Moldex" is no longer available a substitute, "Tegosept M," has been used successfully at the Carnegie Ins tution of Washington Department of Genetics for about two years. This produ is available at the Goldschmidt Chemical Corp., 153 Waverly Place, New York City, and is used exactly the same as "Moldex" (10% in alcohol).

Spencer, W. P. Collecting wild Drosophila.

For making collections of wild Drosophila species, banana mash to which 1 Baker's yeast has been added provides excellent bait. Quart-size freezer pail packs (of cardboard heavily impregnated with paraffin) are hung by heavy string to bushes or low branches of trees. These containers are filled one-third to one-half full of banana mas From a pasteboard cylinder 8 inches to 12 inches in length and about 5 inche in diameter a "collector" may be constructed by covering one end with fine-m cheesecloth. A large cotton plug covered with cheesecloth fits snugly into other end. For collecting flies the cotton plug is removed and the open end the cylinder suddenly pushed down over the fly-trap, which is then shaken. Drosophila, which are positively phototropic, fly up to the cheesecloth end remain there. After flies have been collected from several traps, the cotto plug is inserted. Flies may be removed from the "collector" by pushing the plug up near the cheesecloth, placing a piece of cleansing tissue moistened with ether over the cheesecloth, and covering the end of the collector with cardboard or glass plate. Etherization may be done in the field or flies may be carried back to the laboratory in the "collector." Largest collections are made if the traps are exposed for two or three days. Freezer pail packs are light and, as they nest together, are easily carried in quantity. They are large enough so that bait does not dry out for several days. Overripe bananas for bait can generally be secured in any large town at a wholesale fruit house at little or no cost.

Wallace, Bruce. A new population cage. The fundamental problem of maintaining Drosophila populations was solved by constructing a cage in a way that permits small amount of food to be given the flies periodically, rather than attempting to supply the flies with a large amount of food at once. In the cages developed and described by Dobzhansky, however, there remained irksome difficulties connected with keeping the food from drying out before the flies emerged (solved by periodic addition of fresh yeast suspension), and with fastening the food container securely to the cork (solved(?) by placing three or four small nails at the edge of the cork). In addition, we were faced with the problem of constructing a cage that would expose a population (larvae and pupae as well as adults) to a uniform amount of gamma radiation from a radium scource. (See Research Notes.) Since it would be impossible to handle the cage during its exposure, we wished to reduce all care of the cage to a minimum.

The cages we have built seem to fit our needs. They are plexiglass structures, semicircular in shape, outside diameter 23 inches, inside diameter 18 inches, and depth 4 inches. Consequently, the adult fly population occupies a curved volume, which looks something like half an angel-food cake, 2 1/2 inches from front to back and 4 inches from top to bottom. The 16 food cups are placed in a single row along the curved bottom, so that all are the same distance from the radium source. The curved surface facing the radium consists of fine aluminum screening. Tops are removable to facilitate cleaning. Each cage stands on three legs 6 inches high. By virtue of the shape of these cages, two populations can be placed about a radium source and receive exactly the same amount of radiation.

The food cups are also plastic (more transparent to gamma rays than glass) and are 1 3/4 inches deep by 1 3/8 inches in diameter (inside dimensions). The cups are filled to the top with food enriched with Brewer's Yeast; because of the combination of greater depth and extra yeast, it has proved unnecessary to add fresh yeast suspension to support the developing larvae and to keep the food from drying.

No corks are used in these cages. The floor of the cage is built of two layers of plastic separated by a sheet of rubber. The holes for the cups are cut slightly smaller in the rubber than in the plastic, so that a rim of rubber protrudes around the edge of the hole. This rim fits firmly about the sides of the cup and holds it in place. An extra precaution against flies' escaping is a thick rubber band around each cup; when the cup is in place, this band slips between the cup and the bottom plastic layer of the floor and presses firmly against the rubber layer.

Three of these cages have been in use for seven generations (D. melanogaster) and have proved satisfactory. We estimate that each cage supports about 10,000 adult flies, although this has not been confirmed by actual count. Our cages do not have openings for easy removal of adult flies, but these can be added with little difficulty.

Wittinghill, M. A mosaic mother and a mosaic son.

In classifying the testcross progeny of a gamma-ray-treated ru h th st + sr e^s ca/cu melanogaster female, of the 520 offspring was found to be mosaic in respect to the antennae. She had one thread antenna and one wild-type, and she showed the recessive mutants st sr e^s ca symmetrically. Although nonvirgin, she was isolated to see whether she represented crossing over in region 2 or region 3. The majority of her 220 offspring indicated that she was a crossover in the h-th region, but 5 offspring were of the phenotypes of region-3 crossovers. This might indicate a mosaic gonad. Furthermore, complementary classes of region exchange were found: 3 were th^+ st like one side of the mother, but 2 were th st^+, and each type was verified by further breeding. These and other cla ses of offspring of the first mosaic could be explained if the mosaic female was triploid, and assuming a variable dominance at the thread locus, since recombinations in this region near the spindle attachment are greatly increased in triploids. Inspection in the living state and after preservation in balsam has not revealed any signs of a triploid phenotype externally. Yet there was no other source for th + chromosomes in the laboratory at that time. If she was neither triploid nor mosaic in still other ways in th ovaries, she must have mated to eight or more different phenotypes of brothers to explain the wide variety of her offspring. The difficulty is not solved by assuming that she was carried over from any other culture classified that day.

A second and different mosaic was found among the 220 offspring already mentioned. This son was a bilateral mosaic showing curled wing on the left side but not on the right. The right side showed thread antenna, scarl claret eyes, stripe, and e^s. Somatically, then, this male was a mosaic of two phenotypes common among its sibs. An attempt to backcross this male to its mother failed, but when it was testcrossed to rucuca females cu and rucuca offspring resulted. This indicated a different mosaic for the gonads as compared with the somatic tissues. Subsequent generations revealed no more mosaics in well over 2500 flies. The lines are maintained in stock as "cu (gamma-rayed, mosaic)" and as "rucuca 1949" cultures.

Muller, H.J. The use of rearranged X's and Y's in facilitating class work with Drosophila.

The greatest handicap to the prosecution of laboratory work on Drosophila by undergraduates is the need for obtaining virgin offspring for the making of second-generation crosses. The virgin P_1 can be obtained for the students fairly readily, so that the first-generation cross does not present much of a problem. But for the second-generation cross the backcross, or "testcross" as Bridges called it, is usually desirable, especially for beginners, since it gives a simpler picture of the gamete frequencies than is obtainable from crosses of F_1 by F_1; and for the testcrossing of F_1 females it is necessary (except in the case of crosses of sex-linked genes in which the P_1 female had all the recessive traits) for these F_1 females to be virgins. In most courses, it is too much to expect undergraduate students to come in both in the evening and the morning (sometimes several times) to secure these virgins. But if the instructor secures the virgins for the student, the latter's role virtually becomes reduced to that of a watcher, and only a part-time watcher at that, at a demonstration. He then has to take too much on faith, much of his interest as the active agent in the work is gone, and it is doubtful if such laboratory work is worth the time and effort. Thus the difficulty of getting virgin F_1 has much reduced the extent of laboratory teaching in genetics below what it otherwise might have been.

The difficulty can be, and in our classes of the past year has been, avoided by the method, devised by Stern, of making crosses between stocks differing in the arrangement of their Y-chromosome arms in such a way as automatically to produce, in these crosses, sterile sons and therefore virgin daughters. For application of this method to elementary class use, we have made up a number of otherwise standard stocks, all having males with an $X.Y^s$ (X chromosome of normal structure except that it has a short arm of the Y attached at its right end) and a $Y^{\underline{lc}}$ (ring-shaped Y chromosome having a full set of long-arm but not short-arm genes for sperm motility); that is, the arrangement of $Y^{\underline{lc}}/X.Y^s$. These stocks, termed "sterlizers" (sz) for short, have the following designation ("signal") and composition, being listed in category h of our stock list.

"sz+": $Y^{\underline{lc}}/X.Y^s$♂ & $X.Y^s$ ♀
"sz w": $Y^{\underline{lc}}/w.Y^s$♂ & $w.Y^s$ ♀
"sz y w":: $Y^{\underline{lc}}/yw.Y^s$♂ & $Y^{\underline{lc}}/y$ ct f. = ♀
"sz bw": $Y^{\underline{lc}}/X.Y^s$; bw ♂ & $X.Y^s$; bw ♀
"sz c": $Y^{\underline{lc}}/X.Y^s$; c ♂ &
$Y^{\underline{lc}}/$ y v f. = ; c ♀
"sz e": $Y^{\underline{lc}}/X.Y$; e ♂ &
$Y^{\underline{lc}}/$y v f. = ; e ♀

The attached-X composition of the female is of no significance here, and is present only because the stocks were more easily constructed in this way. They can readily be replaced by separate X's through crossing with the "sz+" stock. However, the stocks are usable in their present form because only the males of the "sz" stocks are ordinarily used for crossing.

These stocks, when taken in connection with our non-sz stocks, suffice for most of the standard crosses illustrating segregation, random assortment, and crossing over involving two or three pairs of genes. Thus, for autosomal linkage of "repulsion" type, sz c males are crossed to virgin females of our ordinary (not sz) bw stock. The automatically virgin F_1 females are than obtained by the student and backcrossed to males of our ordinary c bw stock. At the same time, from a parallel cross of ordinary c males by bw females, the F_1 males, being fertile, are backcrossed to virgin females of the c bw stock. (As before noted, the concession is made of supplying students with virgins whenever these are to be obtained, en masse, from stock cultures.) For the "coupling" arrangement, P_1 virgin females of the sz^+ stock are crossed to c bw males, and the automatically virgin F_1 females backcrossed to c bw males, while F_1 males from a parallel P_1 cross of ordinary + by c bw are backcrossed to c bw virgins. The same operations can be performed, for chromosome 3, with e and ss, using the cross of sz e males by ordinary ss females, and that of sz^+ males by females of our ordinary ss e stock; but these crosses are less to be recommended because of the low fertility of ss and ss e. For random assortment, corresponding crosses involving sz^+ ♂ by c e ♀ or bw e ♀ and sz c♂ or sz bw ♂ by c ♀ are made. For three or more point crosses in which all the mutant genes are recessive and enter from one side, the multiple-mutant females are crossed to sz males and the automatically virgin F_1 females are backcrossed to multiple-mutant males.

It is to be conceded that this method suffers from the disadvantage that the elementary student is not yet prepared to understand why the F_1 males are sterile. We have found it best to postpone the explanation until later, when it adds interest to the matter without detracting from the understanding of the primary principles that were to be illustrated. Naturally, there are a number of precautions to be taken, such as insuring that the P_1 females were virgin, that the P_1 were completely removed before the F_1 hatched, and that no flies of the wrong sex were put in as P_1 or P_2, but these precautions are always necessary anyway. Very rarely, an extra Y is present to prevent sterility, and for this reason two individual cultures of each cross are to be preferred to one mass culture. The fact that the Y chromosome of the sz stocks is ring-shaped prevents it from becoming transformed into an ordinary Y by crossing over with the $X.Y^s$, as happen in other $Y^{\underline{1}}/X.Y^s$ stocks (and also, in the stocks whose females have attached X's, prevents the detachment of the latter). However, as Kenneth Cooper found through cytological examination of our $Y^{\underline{1}c}$ stocks, an occasional $Y^s.Y^s$ is formed (no doubt by crossing over between the two $X.Y^s$ chromosomes), and this if frequent would disturb the scheme. But in practice this method has been found to be a great help in our elementary teaching, and we believe it should overcome the greatest difficulty in the way of more widespread laboratory teaching of genetics to elementary classes.

An additional practical aid, if temperature regulated to between 24° C. and 27° C. is avilable, is the provision of two widely spaced laboratory periods per week, as on Mondays and Fridays, since it is then possible for the students to carry the flies through a generation every 10 or 11 days,--i.e., two generations in 3 weeks.

Research Notes

Barigozzi, C. A new form of melanotic disgeny (generally indicated as tumor) has been found in D. melanogaster (see New Mutants). The dark masses appear clearly through the abdominal wall of the imago, as irregularly located black spots. Histological examination proves that the disgenetic masses are located near the most different organs (intestine, Malpighian tubes, etc.); their structure shows small cells surrounding pigmentary masses, which remain inside the cell cloth. Pubb. Compt. Rendus Int. Congr. Cancer, Paris 1950 (in press).

Bertani, G. A case of hereditary somatic elimination of X chromosomes. The following observations were made in 1948 at the Zoology Department of the University of Zürich with the collaboration of Miss Z. Blankart. Although their analysis is incomplete, these results may interest other workers in the field. A few exceptional cases either of females showing patches of male tissue or of males and females lacking patches of tissue, were accidentally observed in the wild-type stock "Oerlikon" of D. melanogaster. This stock had originally been obtained from a cross between a wild-type individual collected in nature and a Cy/L stock, and was homozygous for chromosome 2 of the wild parent. 1.4% exceptional flies were found among 4248 scored in cultures of the Oerlikon stock. After a few generations of selection their frequency rose to 6.1%. The frequency of exceptional flies increases with the temperature: 2.6% at 18° C., 3.8% at 25° C. (2501 and 3163 flies scored, respectively). The abnormalities observed were of the following types: (a) females with male patches of tissue--male eyes, male wings, one or more abdominal segments showing dark male pigmentation, sex comb present on foreleg, genitalia partly male; (b) males and females showing abnormalities due to loss of some areas of tissue--loss or reduced size of eyes or antennae, loss of some parts of the thorax, loss of a wing, a haltere, or a leg, loss of part of one or more abdominal segments. The abnormal areas were generally small. All the abnormalities listed above can be explained by assuming that one or both of the X chromosomes were lost at some time during the development of the exceptional individuals. The factor that causes this loss acts as a dominant, since abnormal individuals are always found in the F_1 of crosses of Oerlikon with other stocks. In the F_1 of crosses between y cv v f females and Oerlikon males, 7 gynandromorphs had y male patches and 8 had + male patches. This shows that either one of the X chromosomes may get lost and not necessarily the Oerlikon one. The factor that causes this loss is not in chromosome 2, since, in the F_2 of crosses between Oerlikon and b pr c px sp, homozygous b pr c px sp individuals showing abnormalities were found.

Bird, Myrtle J. Mutagenic chemicals. The following compounds have been tested for mutagenic action in D. melanogaster: (a) ethylene oxide, dissolved in saline solution; (b) 1:2,3:4-diepoxybutane, dissolved in saline solution; (c)2:4:6-tri(ethyleneimino)-1:3:5-triazine, dissolved in saline solution: (d)NN-di-(2-chloroethyl)-p-anisidine, dissolved in arachis oil. A comparison has been made of various methods of administration; i.e.--mixing the compound with the food of the larvae, injecting the imagines, and exposing the imagines to aerosols. In all experiments, wild-type (Oregon-K) males were used, and after treatment they were tested for sex-linked recessive lethals by the Muller-5 technique. A summary of the results is given below, and shows that all four compounds are mutagenic and that the injection method is the most satisfactory for both oil-and water-soluble compounds.

Compound tested	No. Chromosomes tested	No. lethals	% lethals
a) Injection--0.5%	713	10	1.4
0.8%	198	9	4.5
b) Feeding--0.01%	809	8	1.0
Injection--0.1%	1288	133	10.3
c) Aerosol--0.5%--2 hours	1323	81	6.1
2.5%--1 hour	957	83	8.7
Injection--0.005%	206	29	14.1
0.008%	266	48	18.0
d) Aerosol--10%--1 hour	164	0	0
2 hours	490	3	0.6
5 hours	1081	8	0.7
Feeding--0.07%	1644	20	1.2
0.09%	465	7	1.5
Injection--1.0%	900	20	2.2

Brncic, D. Mutability rate in the Chilean stock of D. melanogaster, Santiago. With the Muller-5 method it was found that the wild-type stock, Santiago, originated from flies found in Santiago, Chile, had 0.84% sex-linked lethals. Under the same experimental conditions the Oregon-R-c stock presented only 0.088% lethals.

Burla, H., Ernest, F., Gloor, H., and Hadorn, E. Collecting wild Drosophila in southwestern Europe. During September and October, 1950, a collecting trip was made to France, Spain, and Portugal. In 27 different places, far from human habitations, we collected a total of 21,000 Drosophila individuals. Twenty-six known species and four or five new species were recorded. A few preliminary faunistical data are mentioned here. D. subobscura Collin was found to be the most widespread species, and in most places the commonest one. D. pallida Zetterstedt occurred with relatively high frequencies in the region of the Pyrenees. D. fenestrarum Fallen was captured in small numbers in Portugal, where both of the color varieties mentioned by Duda (1943) occurred. This species, exceedingly rare in Switzerland, seems to be limited to coastal regions. More detailed data on systematics and faunistic and ecological observations will be published later.

Castiglioni, M. C. Eye discs of the mutant so (sine oculis of Milani), have been found nearly normal until pupation, and then where transplanted into normal larvae. Development of the transplanted disc generally does not take place. The reciprocal transplantation shows a full development of the normal disc in the so larva. The development of the transplanted and that of the normal eye seem then to be autonomous. An investigation is in progress with a new mutant affecting both eye development and the number of the spermathecae, although not allele of spt. Pubb. Boll. Soc. it. Biol. Sperim. (in press).

Chiyoko, Tokunaga Genetic studies on Aphiochaeta sp.; reverse mutation found in short arista mutant. During the course of genetic studies of Aphiochaeta sp. the author obtained twenty some mutants. Some occurred naturally and others as the result of X-ray irradiation. The mode of inheritance is more or less irregular in most cases. Some of these mutated genes have been definitely located on the chromosomes--for instance, short arista (sa^o) and Delta, on the third chromosome, and bar and truncate (main gene) on the second.

Sa^o appeared during selection experiments (minus direction) with truncate. Genetic studies with sa^o indicated the presence in this mutant of modifiers for this gene. Furthermore, normal individuals appeared from time to time in the sa^o stock. From genetic tests it was found that the majority of the reverted individuals are heterozygous for sa whereas others are homozygous for its wild allele. In three cultures (sa^o x sa^o) the offspring was all phenotypically wild. This is an extreme mass reverse mutation. Some of those reverted individuals were also Abrupt (Ab, sex-linked, homo lethal) and bar. Inbreeding of those reverted wild flies soon gave rise to several mutants, such as Ab-low, Ab, truncate, purple and bar. Short arista reappeared also after several generations.

When a reverted wild male is crossed to a sa female, the sa character behaves, in F_1 and F_2 generations, as if it is sex-linked. Furthermore, when an Abrupt female is crossed to a reverted wild male, and Ab character segregates as if it is no longer sex-linked.

Genetic studies indicated that these unusual phenomena are due to the Y chromosome of the reverted wild individuals. Some other mutants such as sa^1 (a derivative of sa^o), sa reverted back from the reverted wild flies (sa^o - + - sa), and some sa^o individuals have a similar type of Y chromosome. Most of the flies in sa^o and the derivatives of sa^o, such as sa^{c120} bar^{67} and Ab^{67}, were found to have normal Y chromosomes. The lethal (or semi-lethal) on the X chromosome of Ab b and sa becomes ineffective in the presence of the above-mentioned peculiar Y chromosome.

The unusual genetic phenomena mentioned above are explained on the basis of the following assumptions. (1) The Y chromosome in this species has a strong male-determining factor. (2) A translocation between the Y and the third chromosome gave rise to a third chromosome with a part of Y containing the male-determining gene.

Intense cytological studies were made in an attempt to find if chromosomal aberrations are present in sa^o, reverted wild, sa^o derivatives, and Ab^2b^o males having unusual Y chromosomes. Unfortunately, salivary-gland chromosomes are totally unusable and therefore chromosomes of the larval ganglion and of the gonad were studied. Although no aberrations were detected, it is perfectly possible that undetectable chromosomal rearrangements exist. A very strong somatic pairing was recognized during the prophase of the gonial and ganglionic mitosis. Furthermore, each of three pairs of chromosomes has short achromatic sections at constant locations.

Studies on environmental effects on the sa mutant were also made. Sa^o and re-reverted sa individuals were reared from the larval stage at 25°C. (control) and at 18°C., and it was found that the expressivity of the sa character was lowered at 18°C. without changes in the genotype.

It is to be emphasized that the mass reverse mutation of sa^o and the various types of mutation of the reverted wild which have been frequently encountered in the present studies cannot possibly be due to point mutations, for a number of strong reasons, and these phenomena are considered

Di Pasquale, A. Corneal irregularities have been studied in *D. melanogaster*, connected both with In(3R)Mé and with the Y chromosome (see Barigozzi, DIS-23). Heterozygous with a wild stock (Oerlikon) showed a different manifestation rate at the distance of one year, not only for that character, but also for the frequency of the unicellular wing hairs. The finding seems related with the presence of polygenic systems in the Y chromosome. Pubbl. Rend. Ist. Lomb. Sci. Lett. (in press).

Fraile, A., and Sang, J. H. Induction of mutation with Na_3PO_4 and with Harmine. Milani (DIS-20) reported that he was able to induce lethal mutations to the extent of nearly 3% by feeding larvae on a medium containing about 2% Na_3PO_4. This work has been repeated, using Pearl's S101 medium as a base instead of cornmeal-molasses. The NH_3 content of the medium was altered, and the mutagenic effect of Harmine hydrochloride (which produces mutations in yeasts) was also tested, with the following results:

Treatment	No. larvae treated (Ore-K)	Chromosomes tested	No. lethals
Control			
$PO_4'' = 0.045\% : NH_4^{\cdot} = 0.054\%$	150	427	0 (1 semi-lethal)
PO_4'' increased to 1.54% as Na_3PO_4 = Milani	150	396	0
Ditto, but $NH_4^{\cdot}$ reduced to 0.013%	150	447	0
1/10,000 Harmine HCl	150	649	1 (1 semi-lethal)

This confirms Buzzati-Traverso's finding (Ricerca Scientifica E Ricostruzione 8: 3, 1947) that addition of phosphate to the food does not increase mutation rate. This work is being repeated using a sterile, synthetic medium.

Fung, Sui-tong Chan The developmental effects of a sex gene in *D. melanogaster*. Hermaphrodite phenotypes in *D. melanogaster* resulting from the developmental action of a mutant gene are described. The gene is dominant, located in the third chromosome. It is sex-limited in its effect. The males carrying it show no morpholigcal or physiological character changes. The phenotypic effect produced by this gene is first visible in the third-day larvae. Morphologically, the hermaphrodites have two sets of genital ducts and two sets or combinations of gonads. All have sex combs. No fertile triploids carrying the hermaphroditic factor were obtained. They all have sex combs. The hermaphroditic gene does not seem to affect the sexual organs of the intersexes to any noticeabl degree. Salivary-gland chromosomes of the hermaphroditic larvae are cytologically normal; no chromosome rearrangements such as deletions, duplications, inversions, translocations, or fusions were observed. Anatomical and morphological studies suggest that the normal allele of the hermaphroditic factor must be a gene guiding normal development of the sexual organs. Development of the hermaphrodite sex pattern is a dual development of both male and female organs taking place simultaneously. There is no evidence for the initial development of one sex system, then a period of transition followed by the development of organs of the other sex.

Gall, Joseph Effects of X-raying copper-fed Drosophila. The spontaneous back-mutation rate at the mt-3a locus of *D. virilis* was demonstrated to be significantly decreased when copper sulfate was incorporated into the medium in the experiments of Zamenhof (J. Genet., 47, 1945). Since copper is an essential part of several oxidative enzymes, this effect is of very considerable interest in view of the more recent findings of Wyss, Clark, Haas, and Stone (J. Bact. 56, 1948) that organic peroxides produce mutations in bacteria. The experiment reported here was performed to see what effect increased copper content of flies might have on the rate of induction by X-rays of sex-linked lethal mutations in *D. melanogaster*. Females rather than males were irradiated, since it was thought that any effect of copper might be greater in eggs than in sperm because of the larger amount of cytoplasm of the former and their known high copper content. The Muller, M-5, technique was used.

Two groups of Canton-Special inbred females were simultaneously X-rayed with a dose of about 4650 r (300 r/min., 5 ma, 50 KV). One group was a control raised on the standard cornmeal-molasses-agar medium; the other was raised on the standard medium plus 5 mg/ml. CuSO$_4$.5H$_2$O. The irradiated females were mated to M-5 males. Virgin F$_1$ M-5/wild-irradiated females were collected as soon as they emberged. The latter were tested by mating to M-5 males, the appearance of any red-eyed males in the F$_2$ or F$_3$ being the criterion of nonlethality of the tested X chromosome.

No significant difference was found between the two series, the rate of induction being 5.85 ± 1.00 per cent in the controls and 6.38 ± 1.08 per cent in the experimental cultures (32/547 and 33/517 respectively). However, in both series it was noted that the rate was much higher for the first F$_1$ females emerging, about 8 per cent, than for those collected approximately a week later, about 2 per cent. This may be due in part to selective elimination of lethals associated with chromosome rearrangements induced in earlier oocytes, and suggests that "mutation rates" for chromosomes treated in eggs must be determined under carefully specified conditions.

Gersh, Eileen Sutton Pigment cells in the white-mottled eye of T(1;4)w$^{258-18}$. Histological study of the eyes of flies of this stock shows that whereas the primary pigment cells are of two types (strongly pigmented or unpigmented) there are three types of secondary pigment cells (strongly pigmented, unpigmented, and intermediate). Fixation by freezing-and-drying is necessary to reveal the intermediate type of pigmentation.

Gloor, H. Polyploidy in Drosophila larvae induced by cold treatment. Nearly full-grown larvae of *D. hydei* were exposed to a low temperature (8°-12° C.) for 10 days. When examined after treatment, some of these larvae were found to contain a considerable number of polyploid ganglion cells, mostly in metaphase, with chromosome numbers up to about one hundred. Of two different wild strains (Morocco and Zurich), both of which have been treated repeatedly in the same manner, only one (Morocco) appears to be sensitive and regularly yields a number of larvae with polyploid cells.

Kikkawa, H. Tryptophane metabolism in Drosophila. Since the report of Butenandt, Weidel, and Becker (1940), alpha-hydroxytryptophane was assumed to be an intermediate substance between tryptophane and kynurenine. But I have recently found that alpha-hydroxytryptophane, which was synthesized by Professor T. Sakan of

Osaka City University, was quite negative as a v^+-substance. A similar conclusion was obtained for Bombyx. On one hand, formyl-kynurenine, which was synthesized by Dr. T. Amano of Osaka University, was positive for vermilion-brown mutant of D. melanogaster. Thus, the tryptophane metabolism in Drosophila may be shown as follows: tryptophane ---→ formyl-kynurenine ---→ kynurenine ---→ 3-hydroxykynurenine ---→ pigments. Of course, it is supposed to exist another intermediate between tryptophane and formyl-kynurenine. The cardinal mutant of D. virilis seems to lack the enzyme which converts formyl-kynurenine into kynurenine, but this assumption is not conclusive.

Koref, S., and Brncić, D. Influence of diethyl stilbestrol on D. melanogaster tumors.

The influence of diethyl stilbestrol on the tumoral incidence of three tumor stocks: bw(tu), se e^{11}(tu 49h), and st sr; tu36a, was studied. The substance was added in a proportion of 1/100 to shell vials containing Birsh's synthetic medium. A total of 2243 flies was examined. It was observed that the estrogenic substance had a marked influence in reducing the number of melanotic tumors in the stocks in which the incidence was normally high: bw(tu) and se e^{11}(tu 49h). The reduction was not statistically significant in the stock in which the incidence is low, st sr; tu 36a..

Lamy, R., and Slizynska, Helena A spontaneous ring-shaped deletion in the Muller-5 chromosome.

Among the offspring of a y w sn female mated to an M-5 male, one y w^a sn female was found. Breeding tests showed that this female was non-disjunctional and had received a deleted X chromosome from the father, containing the w^a locus but not the y or ac loci. Salivary studies showed it to be a ring-shaped fragment including the bands 1B9, 10 (incl.) to 3E1,2 (incl). The fact that y^+ and ac^+ are not included makes it probable that one break--between the ec^+ and fa^+ loci (which on this chromosome are of course at the right end, near the centromere)--occurred to produce the deleted X. A second break in the small right arm of the X would explain the formation of the ring and the survival of the fragment without the telomere.

Preliminary studies show that the M-5 deletion in the males segregates almost invariably with the X, and is easily kept with y w f females. In females heterozygous for M-5 or chromosomes of similar composition, the fragment has not been observed to segregate with the inverted chromosome. Phenotypically, males containing the deleted M-5 are small and rather inviable, with abnormalities of wings, legs, and bristle number. The wing veins are usually strongly Confluens (owing, presumably, to the duplication of the 3C7 band). The appearance of Co in females is very variable, and may overlap wild-type, but there are indications that within a given genotype the degree of expression is fairly constant. The w^a eye color appears somewhat darker than that of ordinary w^a stocks. Females containing two M-5 deletions occur and are very strongly Confluens; they are rather inviable and usually sterile.

Lefevre, George, Jr. Effects of repeated subculturing of irradiated males.

Canton-S wild-type males were irradiated with 5000 r at the rate of 650 r per minute. After exposure they were mated to y w f:= females. All parents were subcultured in fresh bottles after 4 days, again after 5 more days, and a third time after 7 more days. Male progeny were examined for sex-linked visible mutations. Nineteen such mutants were found in the first 3 cultures among 4300 flies examined. Only in the last subculture, made 16 days after irradiation, did mutant frequency decline. Just one mutant, a white-mottled, was found among the 1071 males that hatched. At the same time the frequency of hyperploid females was recorded. Three classes were found: (1) y^+ w^+ f^+, (2) y^+ w^+ f, and (3) y^+ w f. (One y· w·f fly occurred.) The first class contains triplo-X flies as well as ones containing deletions of the irradiated X chromosome. The other classes of hyperploids possess only deleted X chromosomes. The first class, y^+ w^+ f^+, showed no significant change in frequency throughout, comprising about 5 per cent of all the females examined. The other classes, y^+ w^+ f and y^+ w f, were constant in the first two cultures (41 hyperploids in 2714 females) but, unlike the visible mutations, dropped off sharply in the third and fourth cultures (9 days after irradiation), where only 8 hyperploids appeared among the 1054 females examined. In addition In(1)w^{m4} males were irradiated, mated to y w f:= females, and successively subcultured. With one exception only y^+ w^{m4} f^+ hyperploid females were found. The exception, one y w^{m4} f female, proved fertile, and the X-chromosome fragment carrying w^{m4} does not permit survival of hyperploid males.

Lindsley, D. L. The occurrence of inverted attached X chromosomes.

From a cross similar to that described by Lindsley and Novitski (see below) except that the males carried f, y^2 su^{wa} w^a bb/o x In(1)EN sc, y^+ f y, several f females were recovered. Crosses of these females to Muller-5 males yielded only Muller-5 males and f females in the next generation, indicating that an attachment of the X chromatids had occurred in the male. In ganglion metaphase figures this chromosome appears as a large V and has therefore been designated In(1)sc^8 EN, y f y. Such an attached X chromosome probably arose through a crossover between the short arm (Novitski, DIS-23) of In(1)EN at the base of one chromatid and the proximal heterochromatin of In(1)EN at the base of the other.

Also, an attached X homozygous for the Muller-5 chromosome has been picked up.

Lindsley, D. L., and Novitski, E. The synthesis of an attached XY chromosome.

The study of crossing over between the X and Y chromosomes depends upon the analysis of Y fragments produced by such crossing over. Ordinarily the recovery and perpetuation of these fragments presents a problem, since males carrying them are sterile, and the addition of compensating fragments to produce complete fertility is not practical, since the composition of the newly derived fragments is not known. For this purpose, a chromosome carrying all of the X-chromosome genes plus the Y-chromosome fertility factors has been synthesized.

Crossover products between the In(1)sc^8, sc^8 chromosome and In(1)EN, y were recovered, which contained the tip of In(1)sc^8 with y^+ and the base of In(1)EN with y. Males carrying such an X chromosome were crossed to attached X females. Occasional yellow males were recovered; such males are products of crossing over between the distal heterochromatin of the sc^8 EN inversion and an arm of the Y, in which all of the distal genes of the X (y^+ and ac^+) have been replaced by part of the Y. The loci removed, however, are duplicated at the base of the X chromosome which is derived from In(1)EN, and the new chromosome is viable in the male. Of the yellow males, some appear to be Y^S X, In(1)EN, y, since they are fertile upon addition of Y^L only but not upon addition of Y^S only. Males with this chromosome and Y^{sc8} (a normal Y chromosome with the distal uninverted segment of In(1)sc^8, carrying y^+, attached to the tip of Y^L; Muller, DIS-22) were crossed to y/Y" females; only nondisjunctional males should be fertile in the progeny of such a cross, and they should be non-yellow. Large numbers of the F$_1$ of the above mating were put into bottles without examination, and from each of four bottles showing larvae one non-yellow male was recovered. Three of these males when crossed to y^2 su^{wa} w^a bb/O females gave sterile sons, which showed that they were simply nondisjunctional; the fourth, however, always gave fertile male offspring upon backcrossing on successive generations to y^2 su^{wa} w^a bb/o females. It was, therefore, a crossover product between the base of the Y^{S}X chromosome and the Y such that Y^{Lsc8} had become attached to Y^{S}X, giving rise to a chromosome that we have designated as Y^{S}X.Y^{Lsc8}, In(1)EN, y . y$^+$ (abbreviated Y^{S}X.Y). This chromosome is carried in the following way: y^2 su^{wa} w^a bb/O X Y^{S}X.Y^{Lsc8}, In(1)EN, y . y$^+$/O.

In neuroblast metaphase figures the attached XY chromosome appears as a large J with a long arm approximately the length of an autosome and a short arm approximately one-third as long. No Y fragments are seen.

Preliminary results indicate that females homozygous for Y^{S}X.Y^{Lsc8}, In(1)EN, y . y$^+$ are about half as viable as heterozygotes and quite fertile while the males show essentially normal viability.

The reciprocal attached XY chromosome, Y^{L}X.Y^S, In(1)EN, y, has also been recovered, but it has not yet been balanced or its exact constitution determined. In this case a normal Y was used in the place of Y^{sc8}.

Loh, Sing Yuan Early testing as a means of evaluating F$_1$ heterosis between inbred lines of *D. melanogaster*.

Progeny from three strains of *D. melanogaster* were used as foundation stock to establish the inbred lines utilized in these experiments. Matings throughout were full brother x sister in single pairs. A synthetic stock derived from 8 inbred lines was used as the tester parent in the crosses. A 3-day laying period, 5th, 6th, and 7th day after emergence, was standard throughout these experiments. Three sets of data were collected: (1) the hybrid egg-laying performance from different-generation inbreds test-crossed to the synthetic stock; (2) egg yields from pure-line flies after more than 20 generations, and (3) egg yields of single-cross progeny resulting from mating individual inbred lines in all possible combinations.

Real differences in combining ability between strains were found in first-generation inbreds crossed to synthetic testers. Ames 1947 had the highest average egg record, 178.8 ± 2.5 per fly; Ames 1943 was second with 176.2 ± 2.7; Amherst was last with 166.2 ± 2.8. The average standard deviation was around 60 eggs. The average coefficient of variation was about 35 per cent. The distributions for the egg productions of the three strains' hybrids were continuous and symmetrical. Inbreeding does not stabilize the egg productions of the different synthetic-inbred crosses. Instead, the egg productions of these test hybirds decrease steadily at the rate of about 2.4 eggs per generation. The degree of heterosis exhibited by inbred line crosses increases with the generation of inbreeding from the 15th, 24th, and 34th generation. The average percentage increases of the hybrids over the parents are 17.2%, 30.2%, and 62.4% in the 15th, 24th, and 34th generations respectively. The inbreds showed lowered vigor and productiveness as inbreeding advanced, but this loss of vigor is not detrimental to the egg productions of the hybrids made from these inbreds. Inbred lines with more than 20 generations of brother-sister matings show a general downward trend in productivity. The average strain egg production is reduced 4.3 eggs or 3%-4% per generation of inbreeding.

Uncontrolled variations contribute most of the variations in egg production. Differences between reciprocals appear due to the synthetic females' being poor mothers. Line differences are small and irregular. Strain differences are large in the first generation. Continued inbreeding has caused an increasing separation of the strains' egg productions. Within inbred lines, after 20 generations of brother-sister matings, the uncontrolled variances are similar in the successive generation tests. The pure inbreds have 68% more line-within-strain variance than was observed for the inbreds x synthetic over the period covered by the same generations. The strain differences are not significant. No trend was found in the correlation coefficient between successive tests on the same top crosses. The top-cross tests thus contributed no information of value for predicting subsequent performance in later generations.

General combining ability, maternal influences, specific combining ability, and the effects of reciprocal crosses freed of additive, specific, and maternal effects show small effects on line-cross performance. The uncontrolled portion of the total variance, sigma e^2, contributes most to the variance, 60%. Taking sigma e^2 as a standard for comparison, sigma g^2 is 23%, sigma m^2 is 11%, sigma s^2 is 9% and sigma r^2 is 46%. Correlation coefficients between general combining ability, g, values of three different generations are negative and small. Correlations for the maternal effects are small and inconsistent. Values for specific combining ability are positive and small. Those for r are negative and small. The lack of stable estimates for the performance of the different inbred lines suggest strong environmental-genotypic interactions of direct significance to successive yields of the same line crosses.

Lüers, H. Raising Drosophila on a medium containing DDT. Studies concerning the genetic basis of the development of resistance to insecticides have been originated with D. melanogaster. In selection experiments adult flies have been exposed to insecticidal sprays of DDT in Petri dishes. Expecting differences in the speed of the evolution of tolerance or resistance, and for copying conditions in treated farms, selection experiments were arranged in which all developmental stages were exposed to the insecticide. In normal culture bottles the surface of a cornmeal-agar-molasses medium is slightly and regularly powdered with a 5% DDT powder. Then the parental flies are set in. Selection begins at this stage, it continues in the developing larval stages, and from the pupae varying percentages of imagoes are completely unable to emerge or emoge only partially. Flies that do emerge show different degrees of DDT poisoning. Some of them die after about 24 hours even if put on normal food. The rest lose all symptons of poisoning after 24 hours, behave normally, and are subjected to the same treatment.

Makino, Sajiro, and Mizuno, Tsuruo Distribution of some Drosophila species in Hokkaido. Collection of Drosophila has been continued in various localities of the island Hokkaido. D. melanogaster, D. virilis, D., immigrans, D. Nigromaculata, D. histrio, D. funebris, D. soldidula, D. coliforae and D. suzukii were collected during the summer time in the vicinity of Sapporo City. D. funebris seems to show a much wider distribution than others: it was found abundantly in Imagane, Sapporo, Takasu, Obihiro, and Akkeshi. Thus this species shows a distribution ranging from South Hokkaido northwestward to East Hokkaido. Further, we have obtained seven other species whose names are now unknown.

Makino, Sajiro, and Mizuno, Tsuruo Some experiments to induce morphological aberrations with dinitrophenols and menthol in *D. virilis*.

The culture medium used was the following: corn meal (22.4%), sugar (3.6%), agar (0.5%), and water (73.5%). In the experiments this culture medium was mixed with saturated solutions of dinitrophenols and menthol. The culture of larvae was made at 23°-24° C. The flies for experiments were wild-type from Hokkaido. The results of this preliminary treatment are shown in the following table:

Reagents	No. of Indiv.	Abnormalities Induced	% Abnormalities
Control	483	Wing deformation, abnormality in sternite	0.62%
beta-dinitrophenol	385	Assymmetry in wing length, wing deformation, ski, partial deficiencies of longitudinal vein in different grades, abnormal arrangements of hairs on mesinotum, deformation of scutellum, abnormalities in scutellar bristles, excess of posterior crossveins, and deficiencies of anterior crossveins.	6.7%
gamma-dinitrophenol	284	The same as above.	9.5%
menthol	245	Deformation of sternite, abnormal shape of wing, complete and partial deficiencies of anterior crossveins.	4.9%

After the experiment, by means of reciprocal crosses between a female of normal type and a male having no anterior crossveins induced by the treatment with dinitrophenols, it was found that the abnormality induced is a sole permanent modification.

Milani, R. Interspecific courting behavior in *subobscura*, *ambigua*, *bifasciata*, (*tristis*) *obscuroides*.

Reciprocal pairs have been observed for almost all the combinations of these species. *Obscuroides* seems to be completely debarred. All the others court and attempt copulation; however, the attraction seems to vary. The reciprocal crosses seem to be in agreement. *Ambigua* x *bifasciata* court freely and insistently, *subobscura* x *ambigua* rather well, *bifasciata* x *subobscura* very poorly. Male *bifasciata* seem to break court when their antennae are near the nonconspecific female genitalia. The behavior of male *obscuroides*, with non-conspecific females is exactly comparable to their behavior with the dummies (see notes 3 and 5, next page).

Milani, R. Recording sexual behavior.

I have found it very useful, in recording large numbers of observations on behavior, to use a shorthand system based on symbols that vaguely suggest the movements performed by the fly. The recording can be done while watching, and so one need neither depend on memory nor interrupt observations to take notes. Repeating the symbols.

with a known rhythm, or just following the movements of the fly, can give a good idea of the time spent in performing them.

Milani, R. Release of courtship display in subobscura males stimulated with dummies. Experiments have been done using little ovoidal balls of wax connected by a thin copper wire to a handle, and moved near the males. The size varied from that of a drosophila to that of a house fly. Males have been induced to complete display and attempt copulation and mounting. Color and size seem to be unimportant; however, the bulk of the experiments have been done with black dummies. Males kept in mass culture in the absence of females did not react to the model when isolated, and gave poor responses the next day (only a few reacted) but better results afterwards. Males isolated in their first day of life and examined later and repeatedly gave a very high number of positive responses, with consistent evidence of individual behavior both in particulars of the display and in general reactivity. Males reacted also to dummies moved outside of the vials.

Milani, R. Researches on sexual behavior in D. subobscura. The sexual behavior of D. subobscura has been studied by direct inspection. Attempts have been made to check inter- and intra-male variability, both in courtship patterns and in length of copulation. Individual males tend to spend a given time in copulation if a suitable period of rest is provided. Broadly speaking, the length of copulation in subobscura increases, if the interval between subsequent matings is short, but a one-day rest for males who have had one copulation, or two-three days for males who have had more, restores them completely. Some males have four and five copulations with an interval of a few minutes. The frequency distributions of the length of copulation for individual averages, as well as for first, second, etc. copulations, are not unimodal. The shortest observed has been .3 minutes, the longest 75 minutes. The data on the variability of courtship display have not yet been fully analyzed; but it is possible to say that statistical differences in the male display have been observed in courting performed by single pairs, by one male with several females, or by two males with one female. These differences are not in the elements of the display, but in their coordination and frequency of use. British strains have been seen to display occasionally a wing movement which has not been observed in Italian strains and which suggests the incorporation of a frightening display in the courtship. Females have been seen accepting copulation after the protruding of the vagina, which is usually considered a repelling movement, and which is done by both virgin females and females that have had a previous copulation. The latter seems to be repelling to the males.

Milani, R. Sexual behavior of D. subobscura, ambigua, bifasciata, tristis, obscuroides. The above-mentioned species have fully distinct display patterns, particularly obvious in elaborated courtship. The differences are mostly due to coordination and emphasis of movements and in smaller degree to the nature of the movements themselves. The average times of copulation are: 5-10 minutes for subobscura, 17 minutes for ambigua, 7 minutes for bifasciata, 10 minutes for tristis, 17 seconds for obscuroides. The last is the shortest on record for Drosophila species (as far as I know). All these species but tristis have been tested with the wax dummies. The response of subobscura males is described separately (see above); males of the other species reacted positively--sensing, orientating, following, tapping. Occasionally some displayed and circled to the rear, but the courtship broke off when they touched the model. The movement of the model apparently must be adapted to the species. The reactivity varied with the species, but there was no way to determine whether these differences were of a specific nature or depended on the batches of males. It is interesting to note that these species are able to mate in the dark. Preliminary observations of *obscuroides* and *bifasciata* showed that the mating frequency in the dark is much lower than when the flies are exposed to light. *Subobscura*, which gives full response simply to optical stimuli (as proved by moving the dummy outside of the vials) is the only one that does not mate in the dark. The ones that are attracted by the model but do not court it completely have higher mating frequencies when exposed to light.

Neidhardt, Frederick C. Ether susceptibility, phototropism, and activity of several stocks of *D. melanogaster.*

Investigation has determined that there is a wide range of susceptibility to ether among twelve mutant stocks of *D. melanogaster.* Assuming the wild-type (Gambier-K) as a standard, the susceptibilities to ether of these stocks were found to be the following: Gambier-K = 1.00, Ly/D^3 = 1.13, bi ct^6 g^2 = 1.18, al b c sp^2 = 1.20, dp = 1.23, bx^{34}e/Payne, Dfd ca = 1.27, m = 1.31, w^a; ru h th st cu sr e^s ca = 1.42, L^2/sp^2 Cy = 1.55, bi = 1.57, cu kar = 1.70, ss^a = 1.89. It was further observed that the relation between the resistance of a fly to ether and the time required for that fly to recover is in the nature of a direct proportion.

Nine of the above stocks, plus vg, were tested for phototropism, using apparatus suggested by Brown and Hall (J. Exp. Zool. 76: 205-220, 1936). All the different stocks showed a positive phototropism of 95 ± 5 per cent, the mutants' reactions showing no appreciable difference from that of the wild-type.

When these same ten stocks were tested for activity, using apparatus suggested by McEwen (J. Exp. Zool. 25: 49-105, 1918), marked differences were observed. The following values were found for the activity indexes of the various stocks (based on the wild-type): Gambier-K = 1.00, w^a; ru h th st cu sr e^s ca = 0.67, cu kar = 0.35, bi = 0.22, vg = 0.15, ss^a = 0.15 dp = 0.13, bx^{34}e/Payne, Dfd ca = 0.13, al b c sp^2 = 0.09, bi ct^6 g^2 = 0.07 McEwen's apparatus was originally intended to measure phototropism, yet it actually measured phototropism plus activity. Since the phototropic responses were practically equal, as determined above, we can assume that McEwen's apparatus measures activity alone.

It was also found that operations that reduce the wing area of the fly do not affect its phototropic response, but do reduce its activity.

Newby, W. W., and Thelander, R.P. Early development of the head in normal and tumorous head *D. melanogaster.*

Embryological studies have demonstrated clearly that the primordia of the eyes and antennae are present in the newly hatched larva. These primordia appear as a pair of flattened pouches extending from the posterior ends of the dorsal pouches of the larval pharynx. Optic stalks connect them with the brain lobes. At hatching, each primordium contains about 95 cells (on the basis of nuclei count in serial sections) and is about 55 microns long. They double in length by the 16th hour of larval development and quadruple by the 32nd hour. However, the cell number increases over five times by this latter stage. Separate eye and antennal discs are recognizable at 32 hours. The head primordia of Canton-S wild type and tumorous-head larvae show no definite differences before th 32-hour stage. At 32 hours tu-h primordia are frequently asymmetrical and are associated with peculiar cells containing large chromatic inclusions not seen in conjunction with wild-type primordia.

Nolte, D. J., and Stoch, Zelda G. A new South African species, D. opisthomelaina. This new species was recently discovered amongst batches of mixed Drosophilids collected in the north-eastern parts of this country. It appears to have been confused with D. melanogaster and/or D. simulans, which species it greatly resembles. It appears, indeed, to belong to the same subgroup as the last-named two species, and thus to the melanogaster species group of the Sophophora. Both sexes, however, differ from those of the two species in having brighter red eyes. The males differ further in two main criteria. First, the single sex-comb on each anterior tarsus has an average of 7 bristles only; second, the anal plate is prolonged ventrally into a flat-toed plate covered with bristles, and the primary clasper is short, with about 12 primary teeth arranged in two convex rows and 1 secondary tooth anterior to the clasper. The female differs further in the abdomen, in that the fifth tergum also is black; this darker tip of the abdomen, however, is not a constant characteristic in laboratory stocks, since in crowded cultures it greatly resembles that of the other species. The eggs resemble those of the other two species, and so do the mitotic chromosomes, though preliminary study of salivary-gland chromosomes shows an apparently longer arm for the small fourth chromosome. In preliminary tests D. opisthomelaina has proved to be cross-sterile with both D. melanogaster and D. simulans.

Novitski, E., and Lindsley, D. L. Construction of tandemly attached X chromosomes. Previous work on crossing over in attached X chromosomes heterozygous for an inversion appears to be inconsistent with the expectations based on a tetrad analysis. In order to repeat this experiment with a genetic set-up such that the distinctive crossover product--a ring chromosome--would not be subject to undue viability complications, a method was devised for constructing tandemly attached X chromosomes whose derived ring chromosome would be viable in the male, that is, would have no appreciable deficiencies or duplications.

A triploid stock with free X chromosomes was successively crossed first to males with an X chromosome of normal sequence carrying y Hw, then to an X chromosome with inverted sequence, the one used having the left end of the sc^8 chromosome and the right end of In(1)EN, and carrying f, and finally to males with a ring chromosome, X^{c2}, with the markers cv v f. Triploid females with these three different X chromosomes were then mated to B males, and the progeny examined for females that were Hw f but not B. Several kinds of crossovers in the triploid, along with subsequent nondisjunction, will give rise to F_1 females of this phenotype. The type desired, however, was one in which the ring had crossed over with the normal chromosome in one direction and the same strand of the ring had crossed over with the inverted chromosome in the other direction, thus opening the ring out into a large V, with each arm of the V a complete X chromosome. Since the X chromosomes would be tandemly attached, the pairing configuration would be the same as with an attached X chromosome heterozygous for an inversion, and one of the single crossover products would be a ring chromosome that must structurally be identical to X^{c2}.

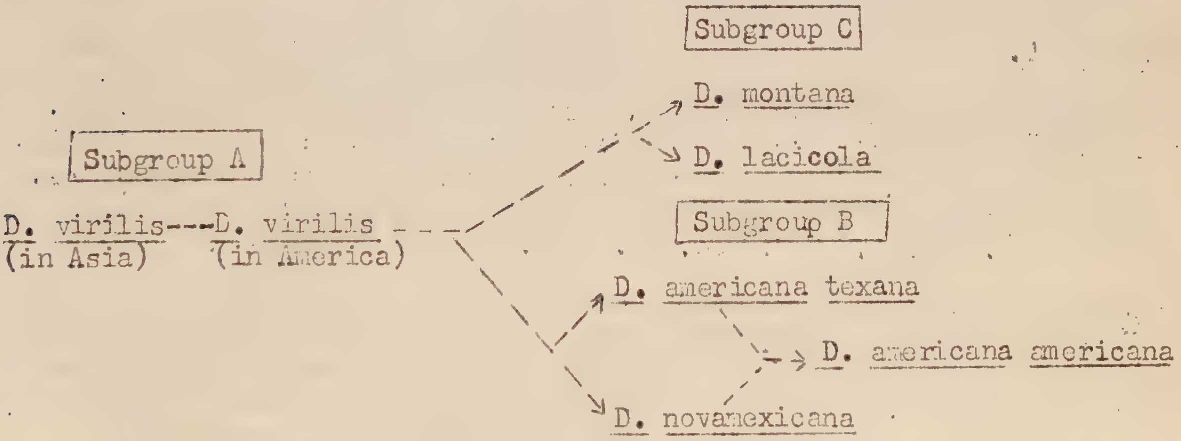
Of fourteen Hw f females tested from the above cross, three proved to be of the desired type structurally, but the one finally selected for analysis carried both cv and v in the heterozygous state, as a result, apparently, of the occurrence of both crossovers in the cv-v region. The mutant genes in the arm in normal order with respect to the centromere are y, Hw, v, and f; and those in the arm in reverse order with respect to the centromere are cv and f.

Oshima C. On the inter-relationships of the virilis group.

From the facts regarding geographical distribution, taxonomic distinctness, and breeding tests, the virilis group may be divided into three subgroups. Patterson and Stone (1949) are of the opinion that D. novamexicana belongs to the same subdivision as D. americana texana, D. americana americana, and D. virilis. According to my experiments, however, D. virilis seems to belong to a subgroup (A) different from that which includes texana, americana, and novamexiacana (subgroup B). Among the hybrid males between subgroups A and B, which have the Y chromosome of virilis, those with the X chromosome of subgroup A are always superior in viability and fertility to the hybrid male having the X chromosome of subgroup B. (DIS-22, 23). In addition to this relation between X and Y, Patterson and his collaborators have observed that there is a Y-autosome relation for the fertility of the hybrid males; thus, subgroup B is perhaps differentiated mainly as regards the sex chromosomes.

D. lacicola and D. montana are the most related species, and they belong to the other subgroup, C. Though the hybrid males between lacicola and virilis are always sterile, the hybrid females show very slight fertility, when they are backcrossed to virilis males. About one-third of the hybrid males among the progeny of the backcrossed females have a rudimentary testis; and they show sterility in the test-cross. However, their sterility has no relation to their sex chromosomes, and it is probably due to autosomal incompatibility. The hybrid males between subgroups A and C do not show any such relation, showing that subgroup C is probably diferentiated mainly as regards the autosomes.

From these results, the inter-relationships of the virilis groups may be shown as follows:



Poulson, D. F. Influence of medium uptake and accumulation by larvae.

In our investigations on mineral accumulation by gut cells of larvae of various Drosophila species, it has become increasingly apparent that certain constituents of the medium may markedly influence the uptake and retention of particular mineral elements. In the case of copper, the difference in results between Cu-supplemented standard cornmeal-molasses-agar medium and Cu-supplemented Kalmus medium is strikingly demonstrated both by histochemical localization with sodium diethyl-dithiocarbamate and by radioisotope techniques. In the Kalmus medium tartaric acid acts as a chelating agent and markedly interferes with the uptake of Cu. If tartaric acid is omitted the effect on accumulation is removed, although the pattern differs somewhat from that on standard medium. Such effects are less striking in the case of iron. In the case of silver, which DiStefano (Am. Nat. 77, 1943) found to be tolerated in concentrations as high as 1 mg. $AgNO_3$ per gram of food, the toxicity is vastly greater in the Kalmus medium. At this concentration larvae die within a few hours of being placed on such a medium, presumably through the immobilization of the chloride-regulating mechanism as described by Gloor.

Ratty, Frank J., Jr. Covering sex-linked lethals with a duplication showing position effects. The w-N region of the X chromosome has been inserted as a duplication in the heterochromatin of chromosome 3 ($w^{ms}p$, described by Lefevre, DIS-23, page 59). A survey of lethals in the w-N region was made in order to determine whether they are covered by the duplication, which shows mottling for w, rst, and spl. Only one lethal, a white deficiency produced by crossing over between $In(1)w^{m4}$ and $In(1)rst^3$, is covered and yields fertile males. Two Notches are covered, but give sterile males. Many other lethals, including Notches with no cytological deficiency, are not covered. A few cases of erratic coverage have been noted, in which some males may be produced in one test, but not in a retest. Cell-lethality tests of all lethals and a comparison of results using a similar duplication, N264-58, are in progress. It is possible that most of the lethals are being expressed in a mosaic fashion during development when "covered" by the duplication, thus killing the individual; whereas in a few cases the duplicated loci act as normal dominant alleles except for fertility. However, in the one white deficiency that is fully covered, the eye shows a strong white-mottling effect of the duplication.

Semenza, L. The investigation of interrelations among the following genes of *D. melanogaster* has been accomplished: blt^S (see new mutants), fa^n, N^{B-S}, sd, vg. The results show that the coexistence in the genome of fa^n and blt^S, and of vg and blt^S, produces a combined manifestation of both mutations. The same has not been obtained in the coexistence of N^{B-S} and blt^S, and of sd and blt^S. Pubbl. Boll. Soc. it. Biol. Sperim. (in press).

Strømnaes, Øistein The sensitivity of different strains of *D. melanogaster* to induction of dominant lethals by X-rays. Experiments have been carried out in which 366 males, from 31 stocks representing 18 different strains, were treated with 2300 r-units of X-rays. The irradiated males were mated to virgin females. The percentage of dominant lethals induced in the sperms by X-ray treatment was calculated as that proportion of the eggs that failed to hatch. A total of 90,036 eggs were counted. It was found that there was a significant variation between sperms of different stocks in their sensitivity to the induction of dominant lethals. The lethal range was from 42.54 per cent to 64.78 per cent. The four stocks giving the highest percentages of lethals had a mean of 61.12 per cent eggs that did not hatch, whereas the controls for the same stocks had 4.45 per cent. Four of the stocks giving the lowest percentages of lethals had a mean of 44.05 per cent, and the control series had 3.20 per cent. The variation between the controls for the series giving a high percentage of lethals and the controls for the low-percentage series was insignificant. The males were stored with the females during the whole egg-laying period, which was never longer than one week.

A detailed analysis of the data shows that the variation in hatchability of eggs (fertilized by different males of the same strain) laid during the fourth to sixth days after irradiation was much greater than that of eggs laid during the first three days. The hatchability during the first three days was significantly different from the hatchability during the last three days in 14 stocks and insigificant in another 14 stocks. An explanation of this was made difficult by the fact that of the 14 stocks with significant differences between the first and second three-day periods, nine showed an increase and five a decrease in percentage of dominant lethals.

Valencia, J. I. A case of double position effect involving the forked and Bar loci.

A forked mutant female was found containing an irradiated sc^{S1} B In49 sc^{8} X chromosome from the father and the "plwx" chromosome, marked with 15 recessives, including f, from the mother. The F_1 of this female gave a number of narrow-Bar, mosaically forked males plus other males that were Bar non-forked. The mutant female was apparently a fractional. This was confirmed after establishing stocks by crossing separately B f^{+} males and narrow-B f^{m} (mosaic) males to y f:= females. Furthermore, the cross narrow-B f^{m} males to y f:= females produced yellow non-forked females and yellow forked-mosaic females in addition to yellow forked; all males were narrow-B f^{m} or narrow-B f^{+}. It thus appeared that a suppressor for forked had arisen somehow in the Y chromosome. Further genetic tests showed that this suppression was not covered when in the presence of an X with a Y^{L} or a Y^{S} attached.

Study of the salivary chromosomes revealed the presence of a small deficiency in the treated X, extending from 15E7 to 16A3.4(a). All of this chromosome piece had been inserted in the Y chromosome. Thus the irradiated sperm had been a nondisjunctional one containing both an X and a Y.

The mosaic forked may overlap with wild-type but never appears as an extreme forked; any of the bristles from the head, scutellum, or thorax may be affected. This supressing effect is of interest since it might help in explaining the nature of certain other dominant suppressors. This Y chromosome may be used as a marked Y when used with a forked-containing X chromosome.

The narrow-Bar position effect given in this case is only observed in the presence of the deleted X.

Valencia, J. I. Variegation of the rb locus due to additive heterochromatic influence.

In the course of our investigations on induced mutations at individual loci, numerous variegation ruby mutants have been detected. In all previous cases one of the breaks had been near the ruby region (4C7.8 - 4D1.2) and always to the left of it, the other break being a heterochromatic one. No variegated position effects had been observed from breaks at the right of ruby.

The break furthest to the left of the ruby region, involved in a heterochromatic rearrangement with mottling effect, had been placed at 4C2.4. Another break, which placed 4B3.4 near the heterochromatin of the X, showed no variegation effect. It seems reasonable to think that breaks had been induced on either side of the rb region, further to the left than 4B2.4 and also at or to the right of at least 4D3.4, and had been involved in heterochromatic displacements, but that they were not detected because there was no position effect.

In the present case, however, a piece derived from the X chromosome sc^{S1} B In49 sc^{8}, extending from 3F6.7 to the 7D7 - 10F7-10 inversional junction of In49 and from this junction on to 11B 16.17, had been deleted, and inserted into the heterochromatic region of the left arm of the third chromosome, near the centromere. Despite the fact that both breaks are far removed from the rb locus, a weak position effect upon ruby is observed. Apparently this is due to the fact that the influence spreading from the heterochromatin is being exerted upon the locus from both sides at once. It would seem that the two influences operate additively. If such position effects are due to some substance emanating from the heterochromatin and spreading along the chromosome to the affected locus, it is obvious that in such a case as this there would be a larger amount of the substance reaching the locus.

Wallace, Bruce An experiment on sexual isolation. New species arise as the result of a fourfold process: (1) the isolation of a population from the remainder of the species; (2) development in the isolated population of an integrated polygenic system, which is no longer coadapted to that of the rest of the species; (3) after removal of the isolating barrier, the development of reproductive isolating mechanisms that prevent the formation of ill-adapted hybrids; (4) the development of sexual isolation as a means of conserving gametes. It is possible that (3) and (4) may result from (2) automatically, or that (4) may follow (2) directly. It is known, however, that sexual isolation can arise through the action of selection (Koopman, K. F., Evolution 4: 135-148, 1950).

The rapidity with which isolation had arisen between the sibling species D. pseudoobscura and D. persimilis in laboratory experiments suggested that a similar phenomenon might occur between two strains of one species. An attempt to demonstrate this has failed; the data are presented here because the problem is an obvious one and useless repetition of experimental technique may be avoided.

Two strains, Oregon-R and Florida-19, and two mutants, se and stw^3, of D. melanogaster were used in this experiment. Sepia flies were mated with flies of the Florida strain, se was recovered in the F_2, se F_2 flies were remated with Florida flies, and se was recovered once more. These se-Fla flies carried genetic material of Florida origin (75%) and se origin (25%). A similar series of matings between stw and Oregon-R flies gave a stw-Ore-R stock in which 75 per cent of the genes were of Oregon-R origin and 25 per cent stw^3.

Approximately 200 males and 200 virgin females (aged 3-7 days) of each mutant strain were placed in a Lucite box (3" x 4" x 8") into which one food cup could be inserted. Each day for 4-5 days a fresh cup of food was exposed to the flies. The eggs collected each day were subdivided among 10 culture bottles containing cornmeal-molasses-brewers' yeast-agar medium. The adults were destroyed after the egg sampling was completed. All phases of the experiment were done at 25° C.

When the egg samples hatched, full counts were made of all bottles, and approximately 200 males and virgin females of each mutant type were collected as parents for the next generation. Three types of flies were recovered in the egg samples: wild flies, which arose from heterogamic matings; and stw and se flies, which resulted from homogamic fertilizations. By discarding the wild flies and using only homozygous mutants to continue the population, a selective advantage was bestowed upon any incipient sexual isolation of genetic origin that may have existed between the two strains.

The results of the matings are given in the table below. The data given include numbers of parents, frequencies of +, se, and stw flies among the egg samples, the total flies sampled (n), and the "isolation ratio"--the ratio of frequency of wild flies observed to frequency of wild flies expected. The latter frequency was calculated by taking liberties with Hardy's equilibrium: half the frequency of wild flies observed in the sample was added to the frequency of each of the mutant types observed; the expected frequency of wild flies, then, was twice the product of the frequencies of the two mutants. An adjustment of this sort was required because the "effective" frequency of each mutant among the parental flies may have differed from the numerical frequency as a result of dissimilarities in sexual activity, fecundity, or viability. (The method of calculation of this ratio is not necessarily correct, but its general soundness is indicated by the uniform ratios obtained despite large fluctuations in the frequencies of the three classes of flies.)

Generation	Parents		Offspring				Isol. Ratio
	se	stw	+	se	stw	n	
1	400	400	41.2%	56.9%	1.9%	3,802	1.18
2	400	500*	53.9	32.2	13.9	17,578	1.12
3	381	492	49.7	24.8	25.5	13,245	1.06
4	400	500	53.1	27.4	19.5	10,161	1.07
5	332	366	44.9	36.0	19.1	8,968	.92
6	250	250	59.8	22.9	17.3	11,561	1.20
7	358	371	42.2	15.4	42.4	10,152	.91
8	256	300	40.5	25.1	34.4	11,888	.81
9	250	300	43.7	21.5	34.8	12,638	.89
10	376	400	60.0	20.4	19.5	11,289	1.20
11	396	400	40.7	42.6	16.7	4,854	.87

* stw-Ore-R flies from culture bottles

The results of 11 generations of selection are obviously not significant. The regression of the isolation ratios is given by Y = 1.15 - .02X (S.E. slope = .02). Either no sexual isolation developed, or it developed so slowly that it was not detected. Experimental methods that will intensify the action of selection are now being considered--suggestions are welcome.

In conclusion, the fluctuations of the isolation ratios may be discussed. These fluctuations resulted primarily from the random matings of the parental flies. Essentially, 200 females had a choice of equal numbers of two classes of males; the 95 per cent confidence interval extends from 43 per cent to 57 per cent for a sample of this size. The isolation ratio can vary from .86 (high frequencies of homogamic matings) to 1.14 (high frequencies of heterogamic matings) by chance. The actual range of error would tend to be enlarged because of death of flies, failure of females to mate or oviposit, the limited number of males available, and the error in the egg samples themselves. The isolation ratios calculated fell well within the range of error expected if the true ratio were 1.00.

Whittinghill, M. Another complex mosaic. From a testcross of a "res"/+ female an offspring was found which was both a gynandromorph and a mosaic for the "res" characters. The left side of the specimen was female and wild-type, and some wild-type tissue continued into the right eye. The rest of the right side was male and "res" to the following extent: sex comb, smaller wing, smaller body, male pigmentation of abdomen and external genitalia; thread antenna, roughoid scarlet peach in majority of the eye, hairy wing (but not curled), stripe, and sooty. It did not breed with males or with females, although the abdomen filled with eggs. The specimen is believed to have come from a binucleate egg.

TECHNICAL NOTES

Carpenter, John M. A new semi-synthetic food medium for Drosophila. The following easily prepared medium, developed by the author and used in this laboratory very successfully during the past three years for experimental and stock culturing of Drosophila species, may be of interest to other investigators in the fields of Drosophila genetics, cytology, and ecology.

This food is semisynthetic (ingredients used are C.P. chemicals, except agar and yeast) and has been found to be especially useful in experimental research where a high degree of ingredient constancy is required. It has been found to be highly nutritious and capable of producing from two to three times the number of offspring obtained from the usual types of banana or corn meal food. The use of paper toweling strips or Kleenex as extra surface for pupation has not been necessary, ordinarily. It is an excellent medium for the growth of the yeast necessary for adult nutrition of the flies. The growth of molds is almost completely inhibited by the proprionic acid used.

Solution A

Water (dist.).................	700 cc.
Agar (granular or shredded)...	15 gms.
Sucrose	50 gms.
Dextrose	50 gms.
Yeast (dried Brewers)	80 gms.
KH_2PO_4	1 gm.

Add the agar to 500 cc of the water and bring to a boil, stirring occasionally until the agar is dissolved. Add the sucrose, dextrose, and KH_2PO_4. To the remainder of the water (200 cc.), add yeast, and mix for several minutes in a Waring Blendor (or similar type of apparatus). Add to previous mixture.

Solution B

Water (dist.)	300 cc.
$KNaC_4H_4O_6$ (Rochelle salt)	8 gms.
$(NH_4)_2SO_4$	2 gms.
$CaCl_2$	0.5 gms.
NaCl	0.5 gms.
$MnSO_4$	0.5 gms.
$MgSO_4$	0.5 gms.
$FeSO_4$	0.5 gms.

Add salts to water in order indicated. Mix thoroughly in Waring Blendor. Add to solution A, mixing thoroughly. Finally, add 5 cc. of proprionic acid, stirring thoroughly. Pour into bottles or vials when food has reached a temperature of approximately 40° C. and cool rapidly. (This prevents settling of the suspended yeast.) Spray very lightly with fresh yeast suspension before using. The pH of this food is 4.5 at the above temperature. This formula will produce approximately 30 bottles or 100 vials of food at a cost of approximately 50 cents for the ingredients used.

King, James C. Parasitic hymenoptera in population cages.

An infestation of parasitic chalcidoid hymenoptera was recently found in two of our population cages containing D. melanogaster. The parasites have been identified as Pachycrepoideus dubius (Ashmead), family Pteromalidae. The wasps were first discovered crawling over the pupae in the exhausted food cups, which are subjected to a routine examination for mites. Some wasps were then discovered on the screen of the cages (30 x 30 mesh, opening .0248 in.), which they were small enough to pass through without difficulty. The two populations were transferred to new cages on which the screen had been covered with fine voile, and although six weeks have passed no wasps have been found there since. Large numbers of wasps have emerged from the pupae that were in the cups in the old cages.

This species of parasite is unlikely to become a serious problem in populations of D. melanogaster because of the length of its life cycle. Crandall found the period from egg to adult to be about eighteen days; but from pupae in which we have seen wasps oviposit and which were kept at room temperature, no wasp has emerged until at least thirty-seven days later. Since the eggs are laid only in pupae, no wasp could possibly emerge during the time that a cup is customarily left in a population cage. The wasps apparently establish themselves in our cages by ovipositing in pupae that lay on the floor and were not removed in the exhausted cups. Three other population cages in another room of the same laboratory have not become infested although there have been free wasps in the building. An excellent monograph by H. A. Crandall on the biology of P. dubius is available in Ann. Ent. Soc. Am. 32: 632-54, 1939.

Mickey, George H. Furfural as a mold inhibitor.

In a search for more effective mold inhibitors, which will not interfere with the development of Drosophila, we have found furfural to be superior to Moldex, Tegosept M, etc. A 10 per cent solution in alcohol is used in the same way as Moldex was formerly used.

Parker, D. R. Temperature control in a small laboratory

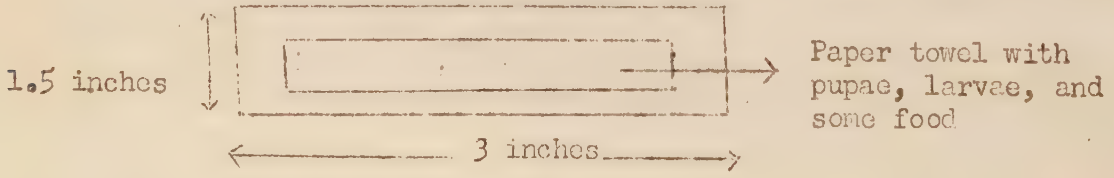
It is possible to maintain a room temperature as low as 22° C., with variation of less than ± 0.5° C., at very little expense. It has been accomplished in this laboratory by using a basement room with a refrigeration-type room cooler (window unit) in series with a Fenwal thermoswitch (cat. no. 17551). All steam pipes have been insulated and an electric heating system substituted. A fan-type electric heater (1.5 kw) is used with a Fenwal thermoswitch (cat. no. 17550). This has been satisfactory in controlling the temperature in a room 14 x 18 feet. An advantage of the type of thermoswitch used is that expensive relays are not needed, although the thermoswitches are quite sensitive and will carry a load up to 25 amperes. These may be obtained from Fenwal, Inc., Ashland, Mass., for about $18 each. Electric heaters may be obtained from any appliance store for around $15, and satisfactory room coolers are supplied by a number of manufacturers for around $300 to $350 for half-ton units.

Rizki, M. T. M. A method of preparation of Drosophila eggs for micro-manipulation.

The difficulty of handling dechorionated eggs of Drosophila can be overcome by embedding the eggs in agar in order to avoid their collapse while performing operations. For this purpose the following procedure has been found useful. (1) Collect the eggs and dechorionate them either by peeling off the chorion or by using sodium hypochlorite (Hill, DIS-19, p. 62; Callen, DIS-21, p. 89; Clark, DIS-22, p. 79). Keep these eggs in a watch glass on the right-hand side of a binocular microscope. (2) Place a few drops of melted agar solution (2.5-5% depending upon hardness of block desired) in a syracuse watch glass #0 under the binocular scope. Use washed agar. (3) Pick up an egg with a blunt glass needle. Meanwhile test the consistency of the agar solution with another glass needle held in the left hand. When the agar is about to set, quickly insert the needle with the egg into the agar. Withdraw the needle immediately with a slight jerk. The egg will remain in the solidifying agar. (4) Quickly place the syracuse watch glass into a fingerbowl of ice-cold water for thirty seconds. (5) Remove the solidified button and trim with a sharp razor blade on all sides. The egg can be oriented as desired while trimming the sides. Trim the agar as close to the micropyle as possible, since this will make it easier for the larva to crawl out of the agar. Leave the block in a wet chamber. *D. melanogaster* larvae hatch in 24 hours at 23 ± 0.5° C. when embedded in 2.5% agar. The survival of the eggs is 90-95%. This technique has been developed during an attempt to try microinjections on Drosophila eggs. One can also observe the developing embryo in agar blocks under a high-power micrscope.

Wedel, Marta, and Andres, J. M. An easy and inexpensive way to mail Drosophila cultures.

Mailing of Drosophila cultures is not easy in many countries because of the cost of air-mail shipment. To overcome this difficulty we have successfully used a small board that may be sent with a letter in an air-mail envelope. This consists of a pasteboard framework one-fifth of an inch thick wrapped with an inner cellophane sheet and an outer adhesive tape in order to avoid desiccation.



In an ordinary air-mail envelope it is possible to send as many as four Drosophila samples, which keep perfectly well for several days. Some of the pupae arrive as adults, any many of the larvae grow to pupae during the trip.

Wortman, Bernard A simple method for the collection of large numbers of eggs from *D. melanogaster*.

The complete food used in the Drosophila laboratory for the maintenance of stocks is increased from 2% to 5% agar and autoclaved for 15 minutes at 15 pounds pressure. The food is poured into sterile Petri plates, allowed to harden, and stored for future use. One to two hundred flies, three to six days old, are placed in a clean, empty half-pint bottle, and a 5% food-agar plate is placed over the opening. Both plate and bottle are inverted and allowed to stand for four to five hours. The plate and bottle are then reinverted, and the plate is removed. The weight of the bottle will leave an impression showing the area from within which the eggs must be taken. The food is hard enough to allow feeding of the flies but not to permit extensive working of the surface. The eggs are laid on the hard surface. A wire-loop needle is used to brush the eggs quickly together and to remove them to a sterilizing solution. The wire-loop needle may be flamed to reduce the carrying over of contaminants.